

MODERN Machine Shop

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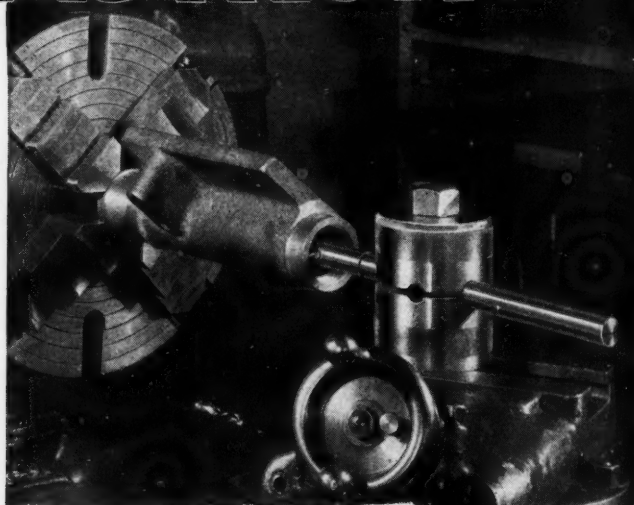
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MODERN Machine Shop

CINCINNATI, OHIO

JULY, 1942

VOL. 15, No. 2

We Present ---

— as the feature article in this month's issue — the second of the two articles describing the new Buick Airplane Engine Plant and some of the more interesting of the operations involved in the production of Wright aircraft engines in that plant. Next month we plan to follow with a third article describing some of the methods and tools employed in the production of engine parts in another one of the Buick plants.

— as the second article this month an excellent paper on "Trends in Improving the Machinability of Steel" which was read by J. D. Armour before the Machinability Section, Cincinnati Chapter of the A. S. M. In this paper Mr. Armour has presented our readers with some valuable data and this article should receive careful attention.

— on page 130 — an excellent discussion of the factors involved in selecting, installing, and maintaining present-day motors. This is invaluable information for the master mechanic and millwright.

— on page 160 — a short but interesting discussion of the production of propeller blades from alloy steel tubing. The propeller blade is a critical piece of fighting equipment, and it must be good.

— on page 168 — an excellent pointer on maintaining the workers' health under conditions of extreme heat. This article deserves reading.

Don't forget the National Metal Congress and Exposition, the time and place for which is given on page 180. It doesn't come until October, but now is the time to begin to make plans for attending.

Several excellent tools are presented in the section "Ideas From Readers" this month and the newest in machine shop tools and equipment will be found in the departments "Tools for National Defense" and "New Shop Equipment." Added to these are the usual cartoon and other departments. And the editor gets "The Last Word" on page 358.

New Buick Engine Plant in Production, II

Production Operations on the Piston and Crankcase Tools and Methods Used

By HOWARD CAMPBELL

Editor, MODERN MACHINE SHOP

THE pistons used in airplane engines are cast from aluminum alloy, and are very carefully inspected before machining to ensure that they are sound in every detail. The principal machining operation is that of rough turning, facing of dome, rough and semi-finish forming of grooves are performed in a Sundstrand model 10 automatic lathe as shown in Fig. 12.

The turning of the outside diameter

of piston is performed by the front slide which travels in a direction toward the head of machine and after approaching a determined stop the front slide travels toward the work to rough form the five grooves and chamfer both ends of the piston; in the meantime the cycle of the machine has been arranged so that the rear slide holding the dome facing tool has begun to travel toward the work simultaneously with the front

slide and the front slide tools for rough forming the grooves are approximately 0.010 to 0.015 ahead of the semi-finish tools in the rear slide.

To provide for assembling the cyl-

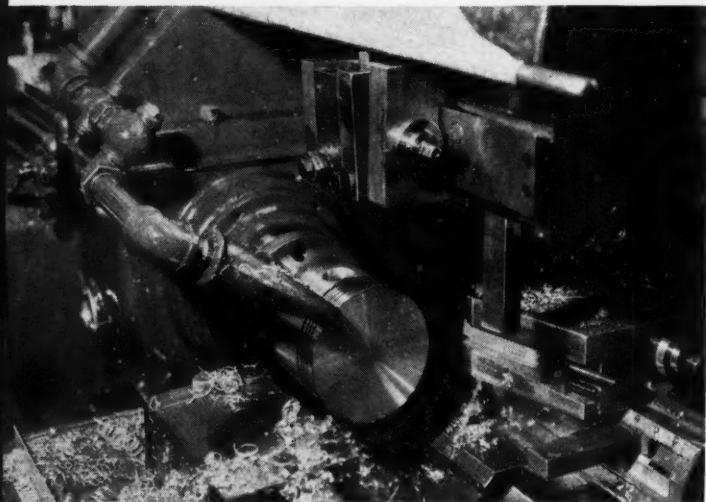


Fig. 12 — The piston is turned, faced, chamfered, and grooved in a single operation in this machine.

Fig. 13—Here two surfaces are machined simultaneously on the crankcase.

inder barrels to the crankcase, a flat surface is provided on the case for each cylinder barrel and holes are drilled in the flat surface for the bolts that hold the assembly together. The flat surfaces are roughed by milling in the Sundstrand Rigidmil shown in operation in Fig. 13.

Two heads operate simultaneously in this operation, each carrying an inserted tooth milling cutter large enough in diameter to partially cover the flat. One head is positioned for machining the bottom row of flats, the other the top row, as shown. The case is held on a rotary indexing fixture built to index accurately to seven positions, thus providing for machining the 14 flats. A limit of 0.010 inch is suf-

ficiently close for this rough operation.

In Fig. 14 a crankcase is shown set up on a Bullard Vertical Lathe to have the diameter turned for the cam ring fit. The front end of the case is also bored turned in this operation. The dimensions on this operation are held to 0.002 inch, which is close for

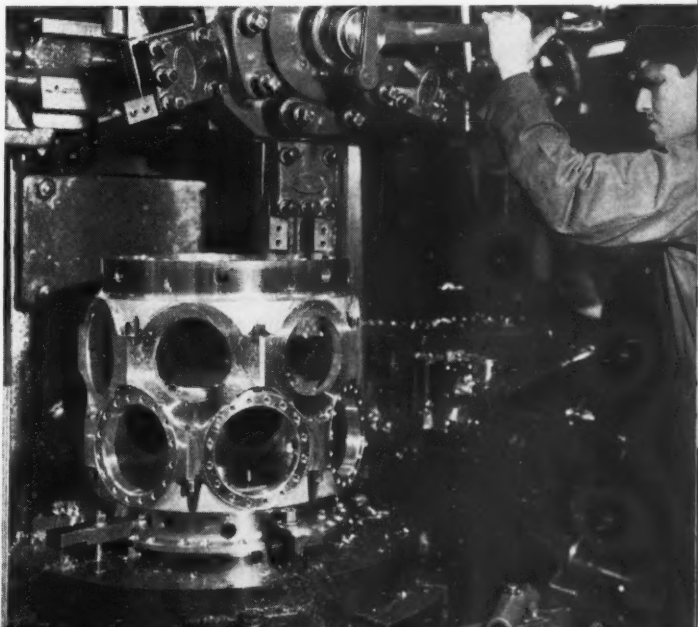
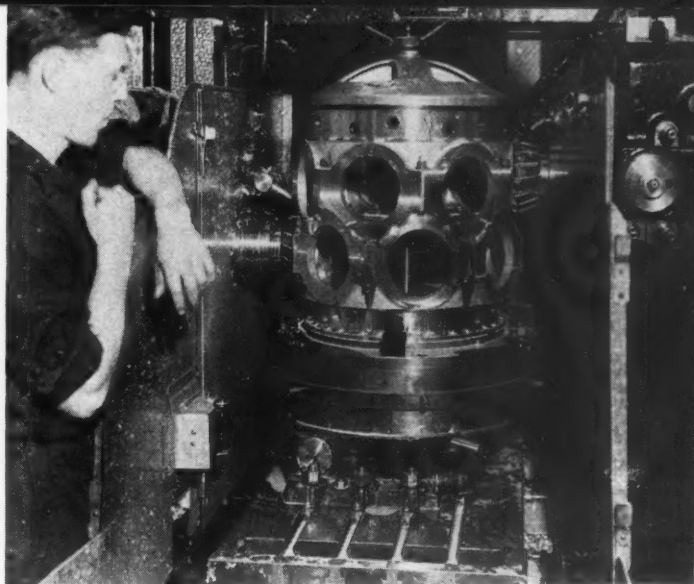


Fig. 14 — The sturdy construction and operating mechanism of the vertical lathe ensure accuracy on the cam ring fit and other dimensions.

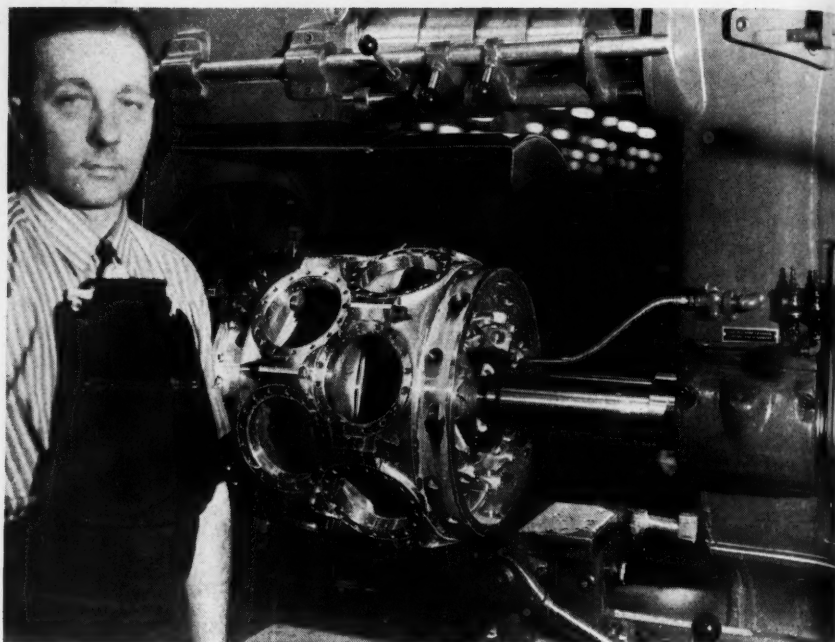


Fig. 15—Grinding the front thrust bearing hole in the crankcase. When the hole is finished to size, the spindle withdraws automatically.

such a large diameter. A snap gage is used to check the finished dimension.

One of the most interesting jobs in the plant is that of grinding the front thrust bearing hole in the crankcase, shown in operation in Fig. 15. This hole is not only to receive the front end thrust bearing; it also serves as a location point for the timer cam after a bronze timer has been shrunk on. Thus, it is easy to understand why the diameter of the hole must be held to within limits of plus or minus 0.0005 inch. This machine also grinds the rear main bearing.

The case is held by clamping it to a plate which locates it, then part is indicated and brought to center. The machine functions semi-automatically; after the wheel has once been set to grind to a predetermined diame-

ter and the machine started, the wheel spindle feeds automatically until the required diameter is reached then shoulder is faced then the machine is tripped and the spindle withdraws and the arm swings up out of the way. Due to the slight wear on the wheel, it may be found necessary to re-set the control and take a few extra passes to bring the hole to size. The wheel, which can be seen just inside the hole in the end of the case, is a 5-inch wheel.

To provide for assembling the manifold to the crankcase blower section, 14 holes are machined in the blower section with the aid of the Natico Horizontal Boring Machine shown in Fig. 16. This machine is equipped with five spindles, to perform the following sequence of operations: rough bore, finish bore, rough

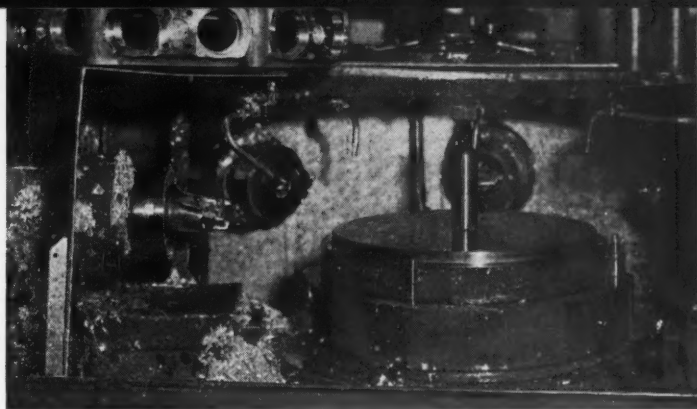
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Fig. 16 — In this five-spindle horizontal machine the holes for assembling the manifolds to the crankcase blower section are rough drilled, finished drilled, rough faced, finish faced and tapped.



face, finish face, and tap. Thus each hole must be indexed to each of the five spindles. In the final operation each hole is tapped with a $2\frac{1}{4}$ -inch 12P. tap to fit a corresponding thread on the manifold. One of the finished blower sections is shown on the top of the machine, but the machine is shown empty so that the tools can be seen.

The machine shown in Fig. 17 is a 21-spindle Natco Drilling Machine, used to drill, rough ream, and finish ream seven bolt holes in the center crankcase section. The bolts that go into these holes are used in the crankcase assembly. The workpiece is clamped in the jig and the machine started, the holes are step drilled first. When one set of tools perform their function, the head rises, the jig is indexed by hand,

and the following set of tools descends at rapid traverse until working position is reached at which point the feed begins.

An interesting feature of this machine is the air-operated slide mechanism for the jig. In order to facilitate the work of position and removing the workpiece in the jig, the jig is mounted on a slide, or track, which extends to the front of the machine so that the jig can be moved entirely clear of the spindles. The jig is attached to the piston of an air cylinder; thus the movement of the jig



Fig. 17 — This Natco is used to drill, rough ream, and finish ream the stud holes in the center crankcase section. The jig is moved from loading position to working position by air-operated mechanism.

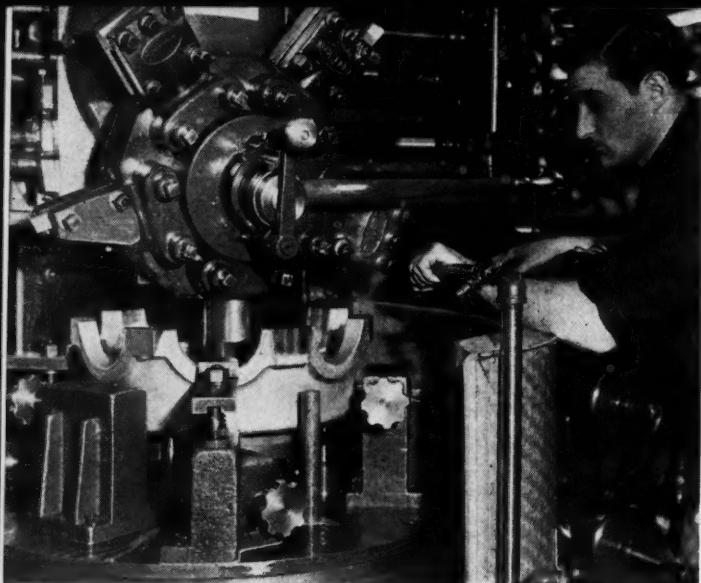


Fig. 18 — Boring the center hole in the middle crankcase section. This hole is held to limits of 0.0002 inch.

back and forth is controlled through the operation of a lever in the air line at one side of the machine. This feature is a good example of the effort that has been made to conserve the operators' time and energy by the use of power wherever possible.

The operation of boring the center hole in the front crankcase section is shown in process in Fig. 18. The machine is a Bullard Vertical Lathe, and the tool used for this work has a tungsten carbide tip. In this operation the outside diameter of the workpiece is rough turned, the inside diameter is rough bored, and the piece is semi-finish faced. The rough

diameter of the hole is held within 0.004 inch.

The 14 holes by which the valve intake mechanism is assembled to the middle crankcase section are drilled in the section with the aid of the

Ex-Cell-O Horizontal Machine shown in Fig. 19. This machine has two spindles, operating simultaneously, both drilling. With the workpiece clamped in position and the machine started, the machine requires no further attention until the piece is finished. The tools feed in, withdraw, and the jig indexes to the following position automatically.

Before the intermediate rear crankcase is considered finished, it is tested to determine whether or not any defect exists by which oil may leak

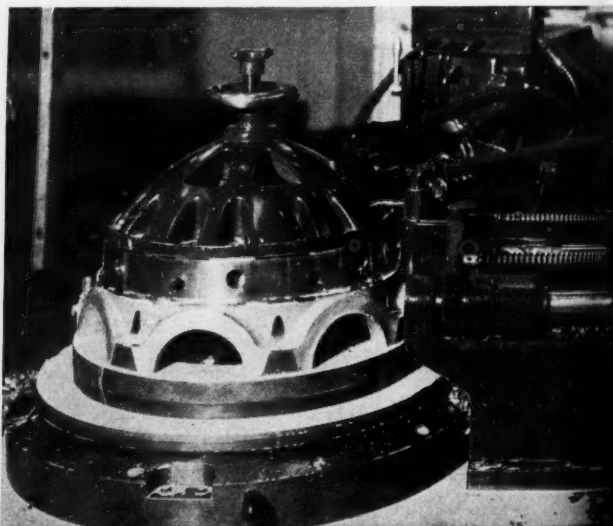


Fig. 19 — Drilling and reaming the holes by which the valve intake mechanism is assembled to the middle crankcase section.

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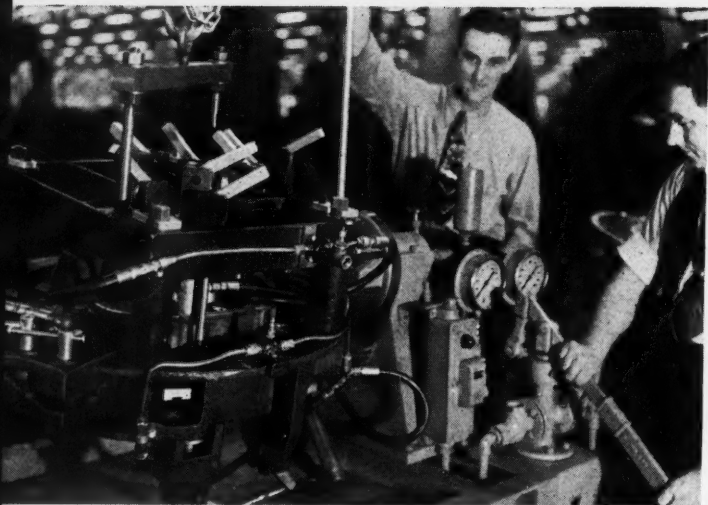


Fig. 20 — Each crankcase blower section is given a test of 250 pounds to the square inch to make sure that no oil leaks will develop in service.

from the section after it has been put into service. This point is important, for if an oil leak develops, the necessary pressure in the unit cannot be maintained. The testing mechanism, with a unit in position for test, is shown in Fig. 20.

To test a unit, the unit is placed in the fixture and all the holes are plugged except one, to which the end of a metal tube is attached. Through this tube water is pumped until the gauge shows a pressure of 200 pounds

out and the pressure falls. This fixture was especially designed for this job, and is a product of the Sheffield Gage Company.

In the two articles that have been presented on this subject, the reader has been taken on a theoretical trip through one of America's great aircraft engine plants and has had an opportunity to see some of the fine machine tools that are now being used to speed the production of aircraft for the defense of America.

Autovent Blower Catalog. Designated as the No. 303, a 76-page catalog describing Autovent Type H and Type HB Centrifugal Blowers has been released by Autovent Fan & Blower Division, The Herman Nelson Corp., Chicago, Ill. The catalog is divided into two sections. Part I is an attractive 20-page bulletin printed in two colors and profusely illustrated with photographs of the blowers showing various drive arrangements and discharges in both single inlet, single width, and in double inlet, double width construction. The text explains construction features, bearings, and performance characteristics of the Auto-

vent Type H Blower with forwardly curved blade wheel and Autovent Type HB Blower with backwardly curved blade (non-overloading type) wheel. Application of both types in heating, ventilating, and air conditioning systems is described.

Part II of Catalog 303 consists of 40 pages of engineering data and capacity tables covering performances of Autovent Type H and Type HB Blowers at static pressures of from $\frac{1}{4}$ to 5 inches. In addition, 16 pages are devoted to dimension drawings illustrating 78 different views. Complete dimension data is furnished for all 17 sizes of blowers. Copy of Catalog 303 free upon request.

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Trends In Improving the Machinability of Steel

By J. D. ARMOUR

Chief Metallurgist, Union Drawn Steel Division, Republic Steel Corporation
Massillon, Ohio*

PERHAPS the most noticeable trend in the study of machinability is the increasing tendency to interchange information more freely and to publish the results of machining investigations. I believe there has been more information on the subject of machining in the literature in the past two or three years than was published in the ten years previous.

Much of this information, however, has been empirical in nature, or developed by the "cut and try" method. What we must do to increase the rate at which we gain knowledge of machining is to stimulate more fundamental research which will develop basic principles and theories that will explain the behavior of metals under the action of cutting tools.

Hans Ernst, of Cincinnati, expressed this thought very aptly in his paper on the "Physics of Metal Cutting" when he said, "One of the most important factors in the development of our civilization has been our ability to use things without knowing how they work, or how they are made. Slow progress, without basic knowledge, is possible, but in recent years we have learned that our rate of progress is tremendously accelerated as we acquire this knowledge. In

fact, only by so doing can we find the solution to the technical problems which now confront us."

In other words, if we are to make more rapid progress in solving the problems of machinability, we must increase our basic knowledge of the factors that affect the machining properties of steel.

Before getting into the question of trends, I would like to review very briefly some of the theories in an earlier paper on the subject, "Making Steels Free Machining" to bring out how theories can be helpful in predicting or, at least, explaining trends and developments in the machining of metals, and how new developments sometimes cause us to modify or change some of our former concepts of machinability.

There are four principal theories that should be kept in mind:

(1) Machinability of steel is favored by low strength, low ductility and the presence of some constituent, such as manganese sulphide, to break up the continuity of the ferrite.

(2) If considerable increase in brittleness can be obtained at the expense of a slight increase in strength, the net effect may improve machinability, but not as much as would be the case if the increased brittleness could be obtained without increasing the strength of the steel.

(3) It is preferable to reduce duc-

* Presented before the Machinability Section, Cincinnati Chapter, American Society for Metals.

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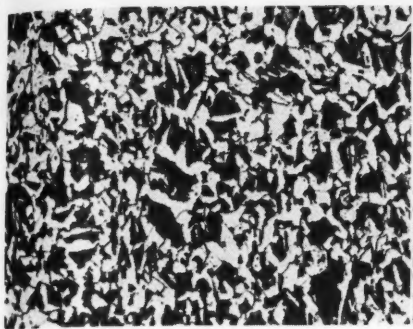


Fig. 1—Blocky Structure (X 100)

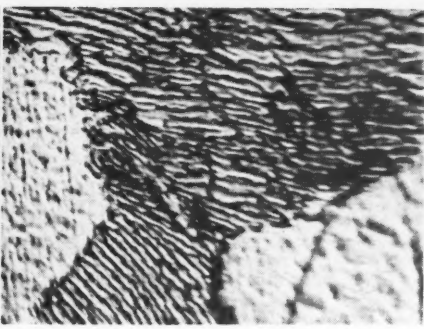


Fig. 2—Lamellar Pearlite Structures (X 1000)

tility by embrittling the ferrite, which can be accomplished by adding a solid solution element like phosphorous, or by cold working the metal, rather than to reduce the ductility by a keying action such as by raising the carbon content and thus increasing the number of pearlite grains.

(4) The best machining structure in steel is a coarse grained, blocky, lamellar pearlite structure produced either by hot rolling practice or by annealing treatments, except that when the carbon content gets above about .50, it becomes necessary to spheroidize a part of the carbide present, leaving the balance lamellar. In very high carbon steels it may be necessary to spheroidize all of the carbide to keep the strength factor from getting too high for the best machining.

The illustration Fig. 1 shows the coarse grained, blocky, lamellar pearlite type of structure at 100 magnifications. Fig. 2 shows the same structure at 1,000 magnifications, which brings out the lamellar nature of the pearlite. Fig. 3 shows the structure (at X-1000) of a 0.53 carbon steel, annealed so that a small amount of the carbide is divorced in order to bring the Brinell hardness down to the best machining range. This sample had a Brinell hardness of 207. Fig. 4 shows a completely spheroi-

dized structure, such as would be desired in a very high carbon steel.

In the field of chemistry the trend toward higher sulphur content to improve machinability is still very much in evidence. During the past 20 years the average sulphur content of the fastest machining steels has increased from 0.100 to 0.400, an increase of 400 per cent, and it is not improbable that it will go to still higher levels. The trend is not restricted to this country alone; but is also much in evidence abroad.

In England, rephosphorized Open Hearth Steels containing as much as $\frac{1}{2}$ per cent of sulphur are being machined at feeds and speeds comparable to high sulphur Bessemer steel, X-1112, in this country. We now have Open Hearth steel in this country also, although not exactly the same composition as the English steel, that will machine comparable to X-1112 Bessemer steel.

In addition to raising the sulphur content of the so-called screw stocks, there has been a tendency to resulphurize slightly the low sulphur carbon steels and even alloy steels.

Considerable study has been given recently to adding sulphur to steel through the medium of sulphur compounds rather than straight sulphur, either as sulphides, such as FeS, MoS, CuS, and so on, or as sulphates such

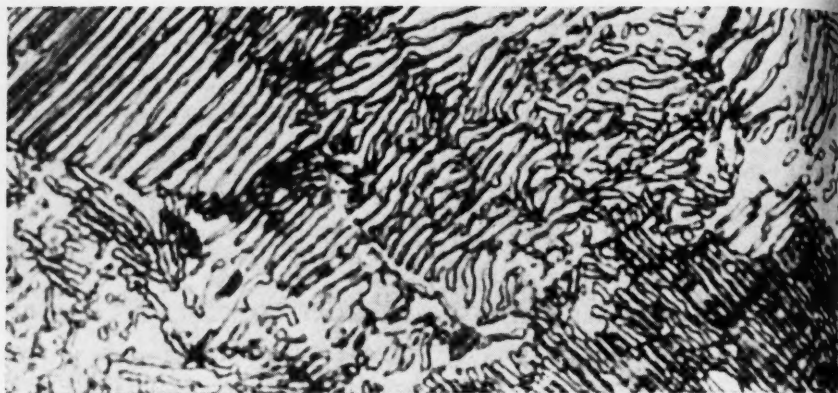


Fig. 3—Slightly Spheroidized Structure of 0.50 Carbon Steel (X 1000)

as FeS_4 , $(\text{N H}_4)_2\text{S}_4$, and so on. Great progress might be made in improving the machinability of steel if compounds of sulphur could be formed that were more soluble in steel, thus producing more uniform distribution. Compounds of sulphur and oxygen show considerable promise in this direction.

Another interesting thought in connection with sulphur is the possibility that it may impart some anti-friction or anti-seizing properties to the steel, thus permitting higher cutting speeds and a smoother machined surface. There may be a parallel here between sulphur in steel and sulphur in cutting oil.

Sulphur in suspension in cutting oils is effective in improving machinability, but sulphur compounds are much more effective. Manganese sulphide particles in steel form a mechanical mixture similar to flowers of sulphur in cutting oil, and it is quite possible that soluble sulphur compounds in steel may be as effective in improving machinability as soluble sulphur compounds in cutting oil.

Considerable time has been given to the discussion of sulphur because we feel that it is by far the most

effective agent for improving machinability of steel, and has possibilities that are far from being exhausted. The trend, however, seems to be more in the direction of experimenting with elements other than sulphur.

Rephosphorizing and dephosphorizing have both been the subject of some study recently in improving machinability. Rephosphorizing slightly may be helpful in steels that would otherwise be very low in phosphorous, and dephosphorizing may be helpful in steels that would otherwise be exceptionally high in phosphorous.

The theory back of phosphorous is that it embrittles the ferrite and increases the strength of the steel, as pointed out under the third of the theories referred to earlier. It will be effective in improving machinability, therefore, up to the point where the harmful effect of increased strength outweighs the beneficial effect of reduced ductility. We do not feel that phosphorous will prove to have a major effect on machinability similar to sulphur, because it increases the strength factor too rapidly in proportion to its effect on ductility.

Nitrogen is another element that has been receiving considerable attention as an aid to machinability.

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Nitrogen in small amounts increases brittleness without increasing the strength materially and seems to impart a higher degree of cold work embrittlement. This cold work embrittlement causes a large drop in impact value of cold worked material compared to hot rolled.

Many other elements and compounds such as oxygen, lead, copper,

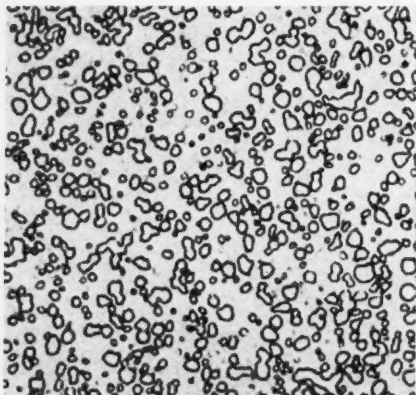


Fig. 4—Fully Spheroidized Structure

silver, tin, arsenic, sodium carbonate, sodium sulphate, iron carbonate, iron sulphate and ammonium sulphate have received attention in the race to find the ultimate in machinability. Of these, lead has attracted the widest attention.

Leaded steels have been in use for a sufficient length of time that some definite statements can be made concerning them. In general, it can be said that a lead content of about 0.20 in steel will give increased production of about 30 per cent. Lead additions will not permit the violation of established practices for making steels free machining if best results are to be obtained, as exactly the same principles of machining apply to leaded steels as to those not so treated.

Physical properties do not seem to

be materially affected by the addition of lead, except when lead segregation (which is a real problem) makes the steel unsound. Heat treating operations will sweat the lead out of the surface of parts made from leaded steel and unless the parts are to be ground after hardening, this may render them unsuitable for use.

Lead fumes are toxic. Therefore, the manufacture of leaded steels, as well as operations like welding, torch cutting, or even heat treating, involve certain hazards unless kept under proper control. Many theories have been advanced to explain the improved machining properties of leaded steel, but it now seems most probable that the function of lead is purely that of a lubricant impregnated in the steel. Silver, which has been used to a limited extent in stainless steel, shows a similar effect on machinability and for the same reason.

In view of the many undesirable features connected with the manufacture and use of leaded steel, it would seem to be desirable to improve the machinability of steel by some other means. Considerable progress along this line has already been made. Both Bessemer and Open Hearth Screw steels are now being made without lead additions that have better machining properties than the leaded screw stocks. In the near future, better machining low sulphur steels will undoubtedly be developed to replace low sulphur, leaded steels.

The investigation of machinability has by no means been confined to looking for the mystic ingredient that will improve the strength, toughness, and shock resistance properties of steel and at the same time impart machining properties rivaling those of brass. Many other phases of the problem besides composition have been explored to a greater or less extent.

For example, hot rolling practice, as it affects machinability, has re-

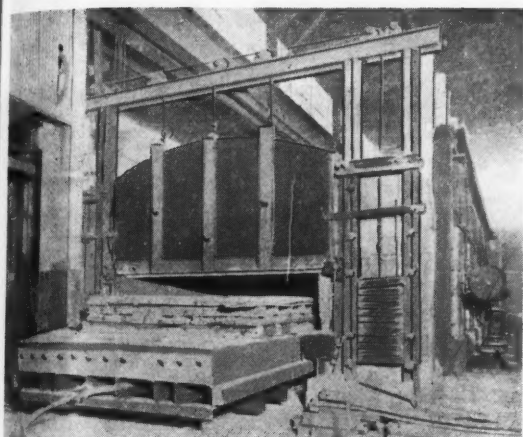


Fig. 5—This Old Style Annealing Furnace Has Many Drawbacks When It Is Necessary to Produce Exact Structures Throughout an Entire Annealing Charge

pearlite in the lamellar form. When the composition of the steel is such that control of rolling temperatures and cooling rates on the hot mill are not sufficient to produce the desired structure for machining, it becomes necessary to resort to an-

nealing or normalizing treatments to obtain the desired results.

nealing or normalizing treatments to obtain the desired results.

ceived considerable attention. For high sulphur steels, particularly, it is generally considered best to roll from the smallest practical billet size. In other words, to put as little work as possible on the steel after the last reheating. This is supposed to give a high finishing temperature with attendant coarse-grained, as-rolled structure, which favors machinability. Recent investigations, however, indicate that the billet temperature or, in other words, the starting temperature on final rolling, may be much more important than the actual finishing temperature.

Cooling rate after rolling is also important as a means of obtaining low strength, blocky structures, and

nealing or normalizing treatments to obtain the desired results.

In annealing practice for machinability, the trend is to furnaces of smaller capacity, improved design, and with closer control, to take up the job where the rolling mill leaves off, for producing definite structures adapted to various types of machining jobs.

Continuous furnaces are well adapted to certain classes of work such as normalizing. Fig. 5 shows one of the old conventional car type furnaces that have been in use for a great many years. It is inclined to develop leakage around doors and sand seals. It is well insulated and has high heat storage, which makes it impossible

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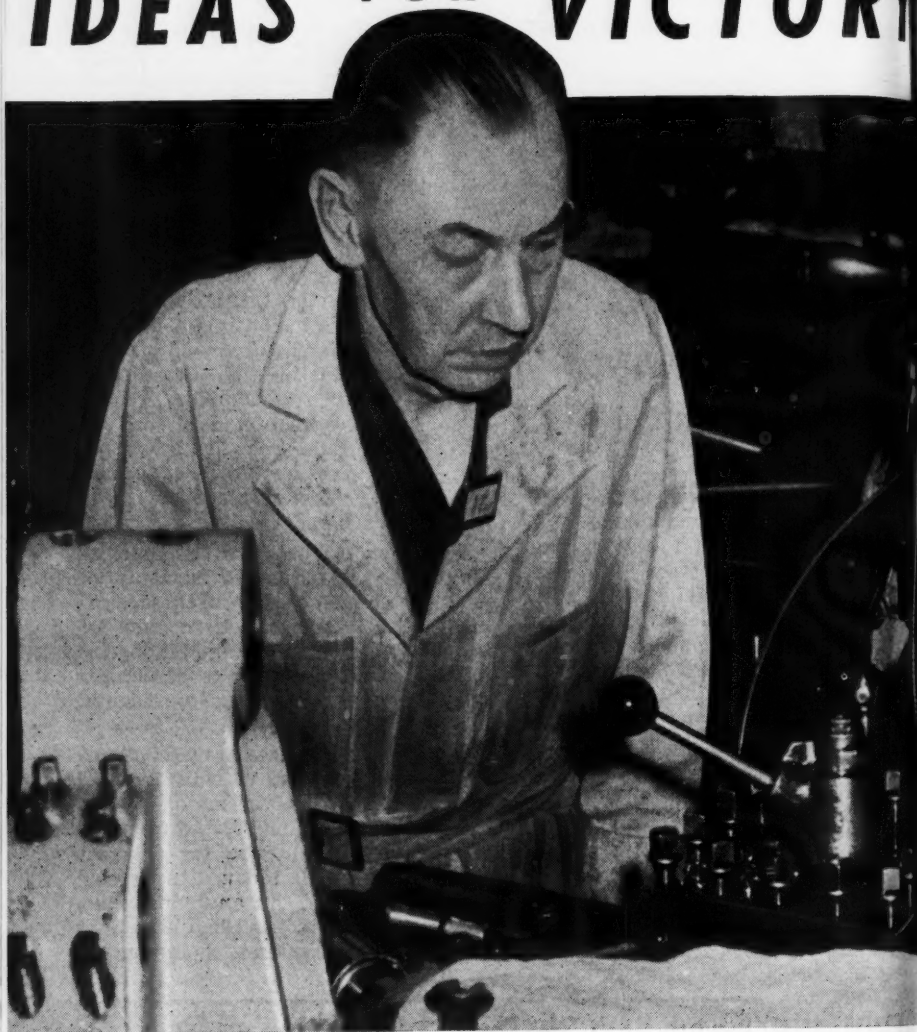
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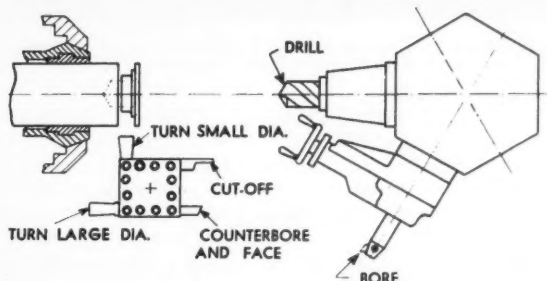
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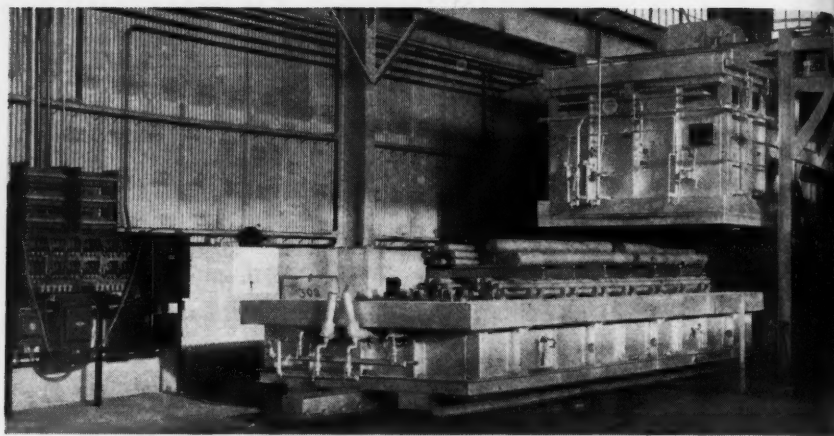


Fig. 6—One of Two New Car-Type Annealing Furnaces Recently Installed at the Union Drawn Steel Division of Republic Steel Corporation, Massillon, Ohio

to obtain quick changes in cooling rate. It has ordinary recording pyrometer equipment with no automatic control, and, therefore, must be put through its paces entirely by hand operation of the burners.

Figure 6 shows two new bar stock annealing furnaces just being completed at the Union Drawn Division of Republic Steel Corporation. These furnaces are designed for low heat storage and maximum flexibility so the cooling rate can be changed readily. They are fired by radiant tube burners, through which air may be circulated to regulate further the cooling rate.

The furnace was constructed as airtight as possible and was designed so that a prepared atmosphere can be introduced directly into the furnace chamber, thus eliminating the necessity of putting a cover over the work when annealing under prepared atmosphere. When the annealing cycle is completed, the top of the furnace is elevated and the charge is pulled from under it. Several thousand dollars worth of pyrometer equipment and automatic control mechanism are required for each furnace.

Figure 7 shows a continuous roller hearth annealing and normalizing furnace which has just been completed at the same plant. The furnace has a recirculating atmosphere system that can be used for stress-relieving treatments and drawback temperatures up to 1,200 deg. F. For higher temperatures there is a conventional low pressure burners system that fires both above and below the hearth. The furnace is divided into three zones, each of which can be maintained at a different temperature, so that it will be possible to normalize and drawback simultaneously with one trip through the furnace. The furnace also has an elaborate automatic temperature control.

Figure 8 shows a battery of pot furnaces, each of which has a capacity of about 4,500 lbs. of coil stock. The small charge and the design of the furnace makes it possible to heat very rapidly and to control the cooling cycle within narrow limits. Excellent uniformity can be obtained with these furnaces. They also have automatic temperature control for program annealing.

The next few years will unquestionably produce striking advancements

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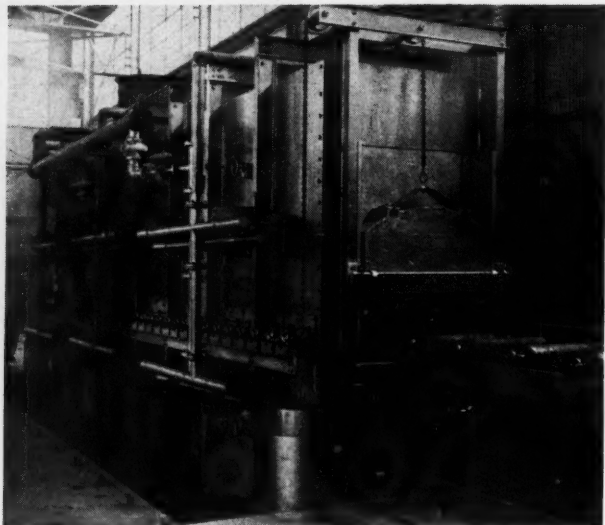


Fig. 7—This New Continuous-Type Roller Hearth Annealing and Normalizing Furnace has a Circulating Atmosphere System

in the machining of metals. This may sound like idle prophecy, but it is based on unmistakable signs that have never failed to produce revolutionary changes in industrial processes.

The industrial world is becoming decidedly machining conscious. Technical societies are holding more frequent symposiums on machinability; papers on the machining of metals are beginning to find a regular place in all comprehensive programs of metallurgical societies; companies and institutions are making extensive scientific studies of machining problems, and in-

and a receptive attitude on the part of the beneficiary—have been complied with, we may feel assured that the future will give us more and more striking developments in this field.

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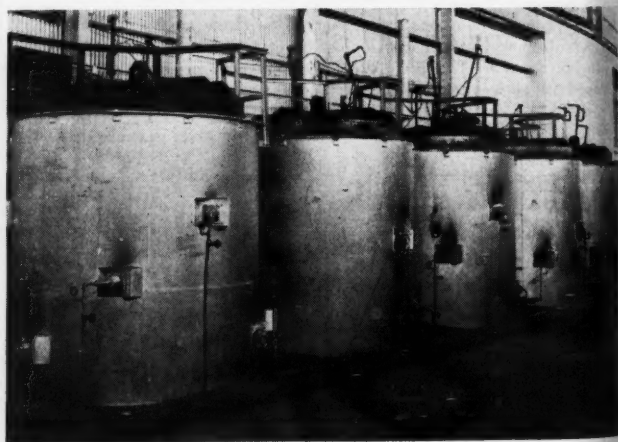


Fig. 8—Each of These Pot Furnaces Has a Capacity of 4500 lbs. of Coil Stock.

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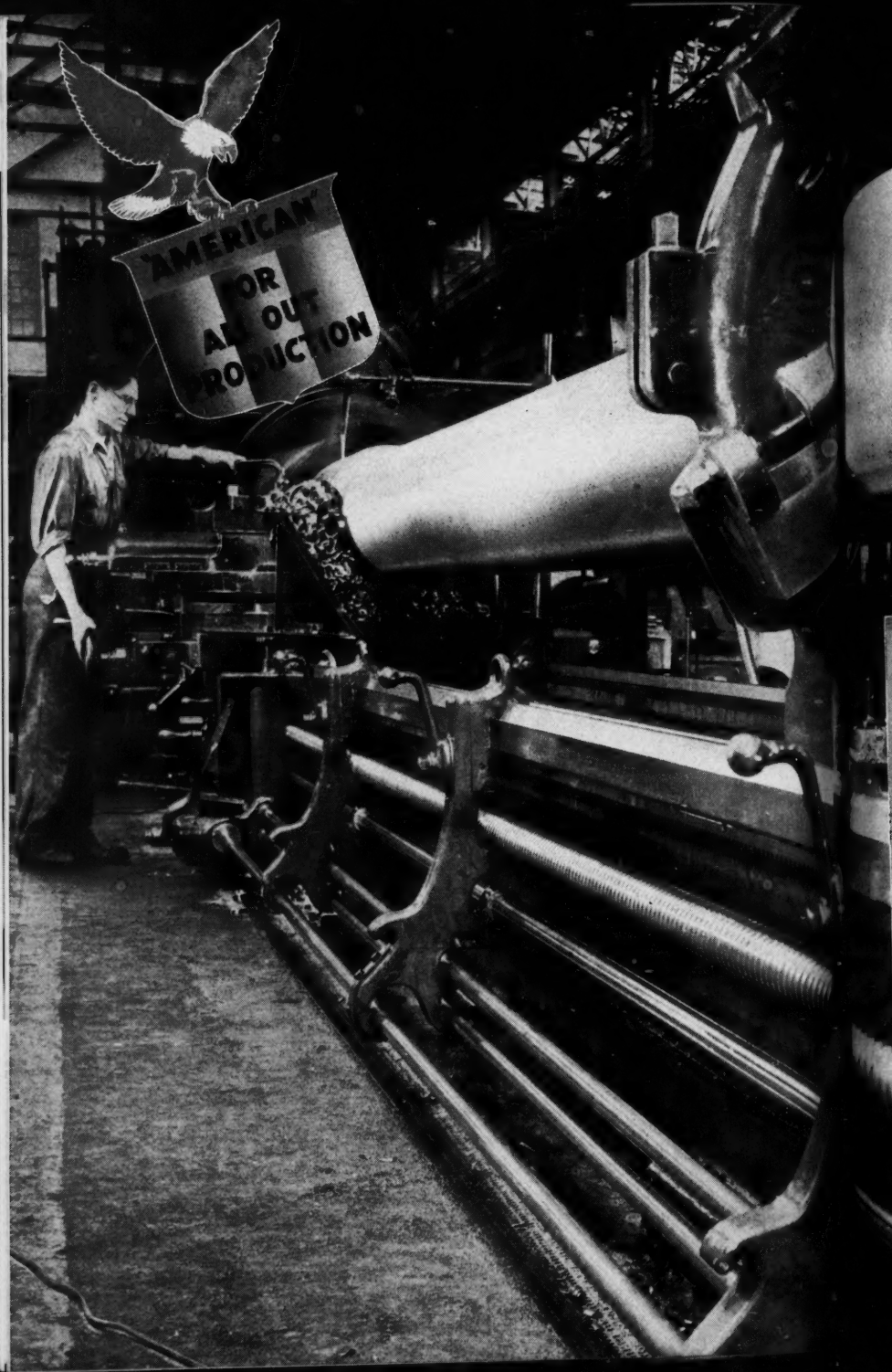
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How to Select, Install, and Maintain Electric Motors

By O. F. VEA

Motor Division, General Electric Company

PRESENT-DAY conditions make it necessary that all electric motors be babied. Maintenance programs must be intensified to prevent breakdowns, because 24-hour-a-day, 7-day-a-week war production schedules cannot be interrupted; output lost today cannot be made up tomorrow. Even the failure of an inconspicuous piece of equipment can cause a considerable disruption in production.

On the other hand, industrials engaged in non-war activities must "keep 'em turning" as long as possi-

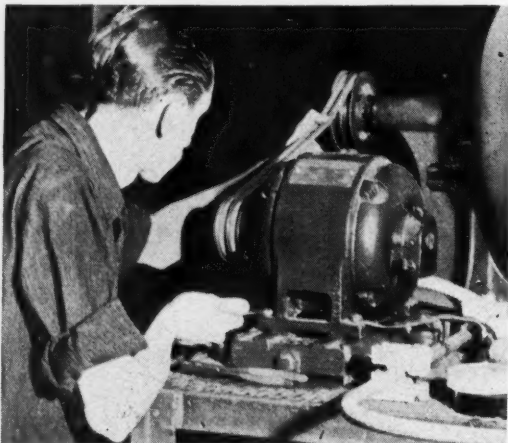
ble because of the difficulty of obtaining new motors without the necessary priority rating.

This article will discuss a general maintenance program. Wherever available the specific instruction sheet accompanying each motor should be followed.

Selection and Installation

A real maintenance program begins with selection. Motors must be chosen that are properly rated and protected for their work. The selection involves a study of requirements such as continuous or intermittent duty, starting, torque, speed regulation, and the like. These all have a bearing on just what type of motor to choose.

Tables I and II show characteristics and applications of standard a-c and d-c motors respectively. In addition, the environment in which the



▲
In Installing a Motor, Position It so that it Will Be Accessible for Repairs. Care should Be Taken to Align the Motor Properly with the Driven Load

Connections to the Motor Should Be Made Tight Enough so that Vibration will not Loosen Them. Wires Joined in a Conduit Box should be Either Twisted Together and Soldered or Bolted Together. These Joints should First be Wrapped with Rubber Tape, then with Friction Tape



motor is to operate should be considered, as this determines whether an open motor or some form of enclosed motor should be used, and how the motor should be located with respect to the driven load.

The next point to be considered is installation. The most important items from the standpoint of long, trouble-free life for a motor follow. The motor should be positioned so that it will be accessible for inspection and repairs. Of course, it is always advisable to install the motor in a place free from adverse conditions unless it is built in a protecting enclosure. It is also important to see that the motor has ample ventilation so that heat losses will be carried away.

A standard motor should not be installed where the ambient temperature or normal temperature rise is more than 40 degrees C. The motor should be installed on a solid foundation which is free from vibration. If it is direct-connected or belted, care should be taken to secure proper alignment, so that rotor end-play within reasonable limits will be possible.

All these factors must be taken into consideration if inspection and maintenance are not to be discouragingly difficult.

Connecting the Motor

All electrical connections to a motor should be made tight enough so that vibration will not loosen them. Wires joined in a conduit box should be either twisted together and soldered, or bolted together. These joints should be wrapped first with rubber tape, and then with friction tape.

Wires issuing from a conduit box, especially rubber-covered extension cords, should be held in some way so that there is no strain on the connections themselves. Usually a knot in the wire inside the conduit box, or the use of conduit-box fittings that grip the wire where it leaves the box, are the most convenient ways to obtain this strain relief.

Starting the Motor

A little extra care when starting a motor for the first time is a good investment. For example, trouble may be avoided by a look at the brushes of a direct-current or single-phase repulsion motor to make sure that they are seating properly on the

commutator, and with the proper pressure. It is always good practice to turn the motor over by hand before applying power to be sure that it turns freely, and that no foreign materials or objects have fallen into the motor during shipment or handling.

Inspection

When the motor has been properly selected, installed, and connected, the maintenance program really begins. To insure efficient operation and maximum production, inspection and servicing should be systematic.

Frequency of inspection and degree of thoroughness vary, and will have to be determined by the maintenance engineer. They will be governed by (1) the importance of the motors in the production scheme (that is, if the motor fails, will the whole works be shut down?), (2) percentage of time the motor operates, (3) nature of service, and (4) environment.

An inspection schedule must, therefore, be elastic and adapted to the needs of each plant. The following schedule, covering both a-c and d-c motors, is based on average conditions insofar as duty and dirt are concerned:

Every Week

1. Examine commutator and brushes.
2. Check oil level in bearings.
3. See that oil rings turn with shaft.
4. See that shaft is free of oil and grease from bearings.
5. Examine starter, switch, fuses, and other controls.
6. Start motor and see that it is brought up to speed in normal time.

Every Six Months

1. Clean motor thoroughly, blow out dirt from windings and wipe commutator and brushes.
2. Inspect commutator clamping ring.

3. Check brushes and renew any that are more than half worn.
4. Examine brush holders and clean them if dirty. Make sure that brushes ride free in the holders.
5. Check brush pressure.
6. Check brush position.
7. Drain, wash out, and renew oil in sleeve bearings.
8. Check grease in ball or roller bearings.
9. Check operating speed or speeds.
10. See that end play of shaft is normal.
11. Inspect and tighten connections on motor and control.
12. Check current input and compare with normal.
13. Run motor and examine drive critically for smooth running, absence of vibration, worn gears, chains, or belts.
14. Check motor foot bolts, end-shield bolts, pulley, coupling gears and journal setscrews, and keys.
15. See that all motor covers, belt and gear guards are in good order, in place, and securely fastened.

Once a Year

1. Clean out and renew grease in ball or roller bearing housings.
2. Test insulation by use of megger.
3. Check air gap.
4. Clean out magnetic dirt that may be hanging on poles.
5. Check clearance between shaft and journal boxes of sleeve-bearing motors, to prevent operation with worn bearings.
6. Clean out undercut slots in commutator.
7. Examine connections of commutator and armature coils.
8. Inspect armature bands.

Records

The competent maintenance man will have a record card for every motor in the plant. All repair work with its cost, and every inspection

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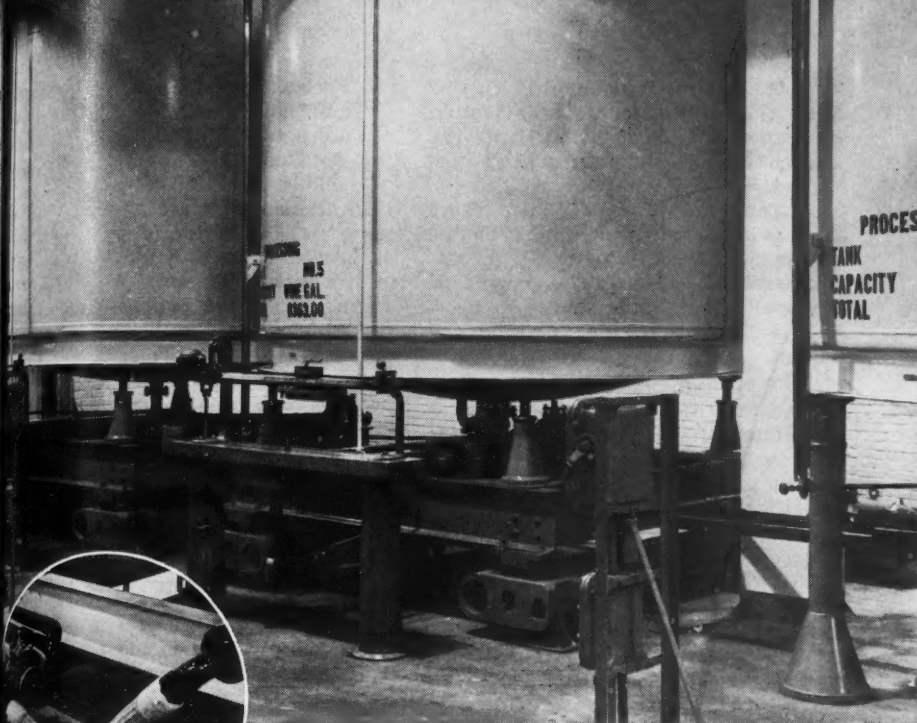
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can be entered on the record. In this way, excessive amounts of attention or expense will show up and the causes can be determined and corrected.

Inspection records will also serve as a guide to tell when motors should be replaced because of the high cost to keep them in operating condition. Misapplications, poor drive engineering, and the like will also be disclosed.

Lubrication

One of the major features of a maintenance program, from the standpoint of effect upon the general performance of a motor, is proper lubrication.

The point has now been reached where the bearings of modern motors, whether sleeve, ball or roller, require only very infrequent attention. However, oiling and greasing of new motors is quite often entrusted to careless attendants who have been used to lubricating older designs, with housings less tight than on modern machines.

As a result, oil or grease is copiously and frequently applied to the outside as well as the inside of bearing housings. Some of the excess lubricant is carried into the machine and lodges on the windings, where it catches dirt and thereby hastens ultimate failure.

If the proper amount of a suitable lubricant is applied before starting, there should be no need to refill the housings for several months, even in dusty places.

Greasing Ball-Bearing Motors

Only a high grade of grease, having the following general characteristics, should be used for ball-bearing lubrication:

1. Consistency a little stiffer than that of vaseline, maintained over the operating-temperature range.
2. Melting point preferably over 150 deg. C.

3. Freedom from separation of oil and soap under operating and storage conditions.

4. Freedom from abrasive matter, acid, and alkali.

In greasing a motor, care must be taken not to add too large a quantity of grease or it will cause too high an operating temperature with resulting expansion and leaking of the grease, especially with large bearings operated at slow speeds.

The following procedure is recommended for greasing ball-bearing motors equipped with a pressure-relief greasing system:

Make sure that no dirt gets into the bearing with the grease by wiping clean the pressure-gun fitting, bearing housing, and relief plug. Always remove the relief plug from the bottom of the bearing before using the grease gun. This prevents putting excessive pressure inside the bearing housing. Excessive pressure might rupture the bearing seals.

With a clean screw driver or similar tool, free the relief hole of any hardened grease, so that any excess grease will run freely from the bearing. With the motor running, add grease with a hand-operated pressure gun until it begins to flow from the relief hole. This tends to purge the housing of old grease. If it might prove dangerous to lubricate the motor while it is running, follow the procedure with the motor at a standstill.

Allow the motor to run long enough after adding grease to permit the rotating parts of the bearing to expel all excess grease from the housing. This very important step prevents overgreasing the bearing. Finally, stop the motor and replace the relief plug tightly with a wrench.

Greasing Ball-Bearing Motors Not Equipped with a Pressure-Relief System

A motor that is not equipped with

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the pressure-gun fitting and relief plug on the bearing housing cannot be greased by the procedures previously described.

Under average operating conditions, the grease with which the bearing housings of these motors were packed before leaving the factory is sufficient to last approximately one

Apply new grease, either by hand or from a tube, over and between the balls. The amount of grease to be used varies with the type and frame size of the particular motor. The instruction sheet which accompanied the motor should be consulted for this information.

Addition of the correct amount of grease fills the bearing housings one-third to one-half full. More than the amount specified must not be used. When reassembling the motor, any V-grooves that are found in the housing lip should be refilled with grease—preferably a fibrous, high-temperature-sealing grease—which will act as an additional protective seal against the entrance of dirt or foreign particles.

The technique for greasing motors equipped with roller bearings is very similar to that used for ball bearings.

Specific instructions for the individual design should be followed, however, because more frequent greasing or slight changes in technique may sometimes be necessary.

Oiling Sleeve Bearings

The oil level in sleeve-bearing housings should be checked periodically with the motor stopped. If the motor is equipped with an oil-filler gage, the gage should be approximately three-quarters full at all times.

If the oil is dirty, drain it off by removing the drain plug, which is usually located in the bottom or side of the bearing housing. Then flush



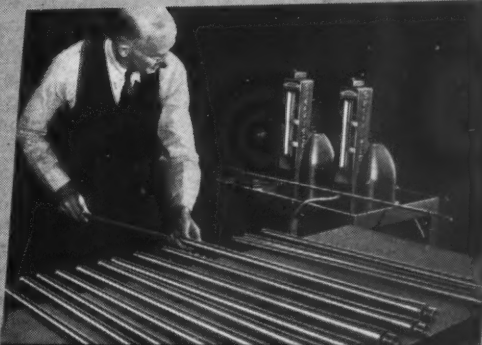
Check the Oil Level in Sleeve Bearings Frequently. This is Especially Important Today because of the Scarcity of Bearing Material

year. When the first year of service has elapsed, and once a year thereafter (or oftener if conditions warrant), the old grease should be removed and the bearings supplied with new grease.

To do this, disassemble the bearing housings and clean the inside of the housings and housing plates—or caps—and the bearings with carbon tetrachloride. When thoroughly cleansed of old grease, reassemble all parts except the outer caps or plates.

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the bearing with clean oil until the outcoming oil is clean.

In fractional-horsepower motors, there may be no means of checking oil level, as all the oil may be held in the waste packing. In such cases, a good general rule for normal motor service is to add thirty to seventy drops of oil at the end of the first year and to re-oil at the end of each subsequent one-thousand hours of motor operation.

Most fractional-horsepower motors built today require lubrication about once a year. Small fan and agitator motors will often require more frequent lubrication, with three-month intervals between oilings.

Sleeve bearing housings are provided with liberal settling chambers into which dust, dirt, and oil sludge collect. The only cleaning necessary is to remove the drain plug and drain the oil, which will flush out most of the settled material with it.

Whenever the motor is disassembled for general cleaning, the bearing housing should be washed out with a solvent. Before being assembled, the bearing lining should be dried and the shaft covered with a film of oil.

Cleaning Ball Bearings

The pressure-relief method of greasing motors, described above, tends to purge the bearing housing of used grease. Complete cleaning of bearings, therefore, is required at infrequent intervals only. For a thorough and convenient flushing when the bearings are not disassembled, the following method is recommended:

Wipe clean the housings, pressure-gun, and relief fittings, and then remove both fittings. Every care should be taken to keep dirt out of the bearings. A bit of abrasive once in a bearing may not be removed even with the most thorough cleaning. Afterwards, it may become dislodged and get between the bearing surfaces, with serious results.

With a clean screw driver or a similar tool, free the pressure-fitting hole in the top of the bearing housing of hardened grease. Also, free the relief-plug hole in the bottom of the housing from old grease to permit easy expulsion of the old grease during the cleaning process after the solvent has been added.

Fill a syringe with grease solvent, such as carbon tetrachloride, and inject some of it into the bearing housing through the pressure-fitting hole, while the motor is running. As the grease becomes thinned by the solvent, it will drain out through the relief hole. Continue to add solvent until it drains out quite clear.

Replace the relief plug and inject solvent until it can be seen splashing in the filling hole. Allow the solvent to churn for a few minutes, and then remove the relief plug and drain off the solvent. Repeat the churning operation until the solvent runs clear.

When using carbon tetrachloride for flushing, replace the relief plug and inject a small amount of light lubricating oil. Allow it to churn for a minute or two before draining off, which will flush out the solvent. To complete the job, grease the bearing, using the method previously described.

This method permits the cleaning of all standard motors operating at an angle not exceeding 15 degrees from the horizontal (except totally enclosed, fan-cooled motors). For these motors, the bearing at the pulley end may be flushed as described. To clean the fan-end bearing, first remove the fan cover and fan in order to make accessible the drain plug at the bottom of the housing.

Care of Insulation

Care of insulation goes hand in hand with lubrication as one of the major features of a motor maintenance program. These features concern the most vital, and probably the

most vulnerable, parts of a motor.

Motors should always be stored in a dry, clean place until ready for installation. Heat should be supplied to protect against alternate freezing and thawing.

Motors that have been long in transit in a moist atmosphere, or idle for an extended period, should be thoroughly dried out before being placed in service. Since machines sometimes "sweat" as a result of a difference in their temperature and that of the surrounding air, they should be kept warm at all times to prevent this condition.

Current at a low voltage can be passed through the windings, electric heaters can be used, or even steam pipes can be utilized for protective purposes. In the case of extended idle periods, tarpaulins may be stretched over the motor and a small heater put inside to maintain the proper temperature.

Drying Out

The most effective method of drying out motors that have become wet by accident or because of "sweating" is to pass current through the winding, using a voltage low enough to be safe for the winding in its moist condition.

Thermometers should be placed on the windings to see that they are heated uniformly. Temperatures should not exceed 90 deg. C. (Class A insulation). This method is particularly effective on high-voltage motors where the insulation is comparatively thick.

Heat can be supplied externally by placing heating units around the machine, covering with canvas, and leaving a vent at the top to permit moisture to escape. In doing this, it is essential that there be a circulation of warm air over all the surfaces to be dried. The air should be allowed to escape as soon as it has absorbed moisture.

Twelve-inch fans set blow air across the fronts of "glow heaters" and then into the lower part of a motor from opposite sides will produce excellent results. The temperature of the winding should not be allowed to exceed 100 deg. C. for Class A insulated motors. Smaller machines can be placed in ovens, the same temperature limits being observed.

Insulation Resistance Tests

The time required for complete drying-out depends considerably on the size and voltage of the motor. Insulation resistance measurements should be taken at intervals of four or five hours until a fairly constant value is reached. These tests are a good indication of the general condition of the insulation and its ability to stand the operating voltage.

The resistance should at least equal the recommended AIEE standard, which is:

Megohms = $\frac{\text{Rated voltage of the machine}}{\text{Rating in kva}}$

$$\frac{\text{Rating in kva}}{100} + 1,000$$

Insulation resistance tests should also be made before a high-potential test, to determine whether the insulation is ready for such a test, and afterwards to make certain that the high-potential has not injured the insulation.

High-Potential Tests

High potential tests should be made after drying out or after repairs to check the dielectric strength of the insulation.

New windings should successfully stand a high-potential test of twice normal voltage plus 1,000. Motors that have been in operation for some time should be tested with this method, *after thorough cleaning and drying*, using a voltage of about 150 per cent of normal voltage, applied for one minute. Small high-potential

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"like a hawk"

until they switched to Tycol Green Cast Grease

This manufacturer had been experiencing numerous difficulties with the grease previously used on his centrifugal boiler pumps and the bearings on his chain stokers. On the advice of a Tide Water engineer they switched to Tycol Green Cast Grease. Since then the nuisance of having to keep an eagle eye on the grease job has been eliminated. Now they just put in Tycol Green Cast Grease and forget it. One less item to worry about — the grease stays put and does an economical and dependable job of lubricating.

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DRUMS! DRUMS! DRUMS! DRUMS!

War needs make it extremely important that all empty drums be returned immediately.



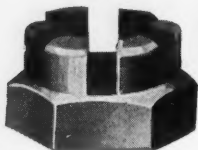
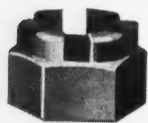
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EASTERN DIVISION

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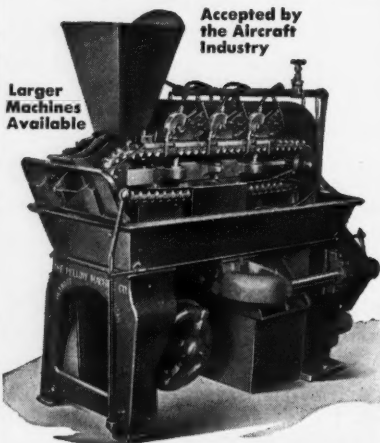
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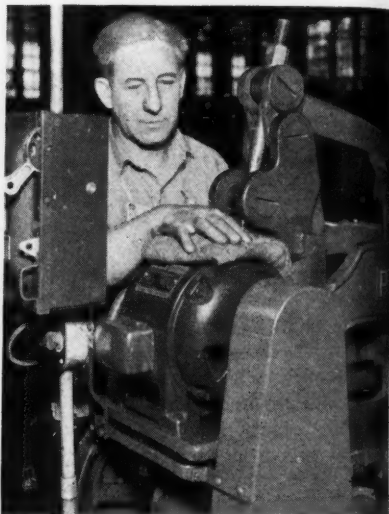
13510 FOLEY AVE.

DETROIT, MICH.

testing sets are available for such work and are of such capacity that very little damage will result from a breakdown during the test.

Cleaning Motors

A systematic and periodic cleaning of motors is necessary to ensure best operation. While some machines are installed where dust, dirt, and moist-



Keep Motors Free from Dust and Dirt by Frequent Wiping. This Motor is Positioned so that the Nameplate can Easily and Quickly Be Read

ure are not present, most motors are located where some sort of dirt accumulates in the windings.

Steel-mill dusts are usually highly conductive, if not abrasive, and lessen creepage distances. Other dusts are highly abrasive and actually cut the insulation as they are carried through by the ventilating air. Fine cast-iron dust quickly penetrates most insulating materials. Hence the desirability of cleaning the motors periodically. If conditions are severe, open motors require a certain amount of cleaning each day. For less severe conditions, weekly inspection and

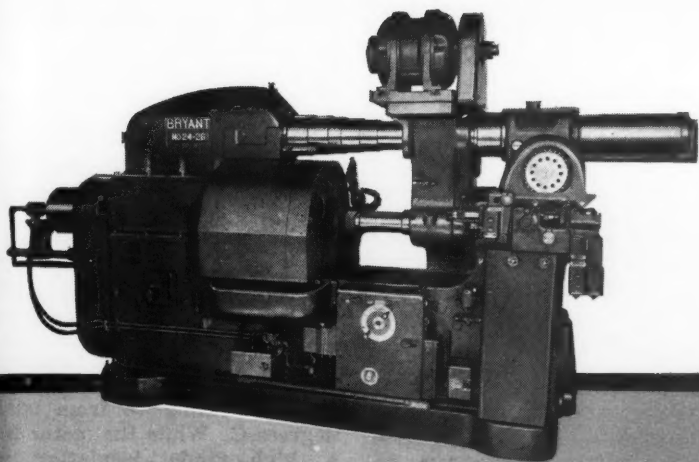
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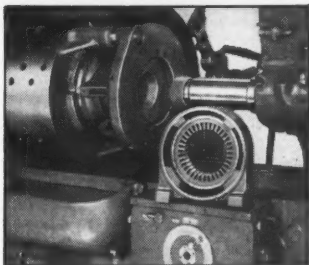
GRINDING MOTOR STATORS on the BRYANT No. 24-26

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Bryant is ready to serve you with greatly enlarged plant capacity and the knowledge gained by solving thousands of internal grinding jobs.



BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

partial cleaning are desirable.

For the weekly cleaning, the motor should be blown out with dry compressed air (about 25 to 30 lb. per sq. in. pressure). Where conducting and abrasive dusts are present, even lower pressure may be necessary, and suction is to be preferred due to the fact that damage can easily be caused by blowing the dust and metal chips into the insulation. On larger d-c machines the air ducts should be blown out so that the air can pass through as intended.

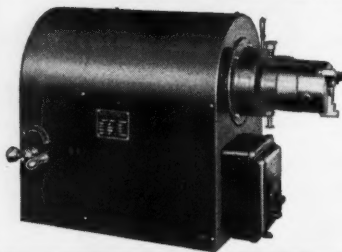
In cleaning a motor, the heavy dirt and grease should first be removed with a heavy, stiff brush, wooden or fiber scrapers, and cloths. Rifle-cleaning brushes can be used in the air ducts. Dry dust and dirt may be blown off, using dry compressed air at moderate pressure. Care must be taken to direct the air so that dust will not be pocketed in the various corners.

Grease, oil, and sticky dirt are easily removed by applying cleaning liquids like carbon tetrachloride, gasoline, or naphtha. There are several good methods of applying the cleaning liquid. Probably the best method is to spray it on. Care must be taken not to soak the insulation by dipping coils or small motors into the liquid.

While the insulation will dry quickly at ordinary room temperature after cleaning, it is highly desirable to heat it to drive off all moisture before applying varnish. If the motor can be spared from service long enough, the insulation should be dried out by heating to from 90 to 100 degrees C. While the motor is warm, a high-grade insulating varnish should be applied. For severe acid, alkali, or moisture conditions where oil or dusts are present, special varnishes can be supplied.

The varnish may be sprayed or brushed on. For small stators or

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help your tool maker do his job
better and will help you get tools
that do more and last longer!

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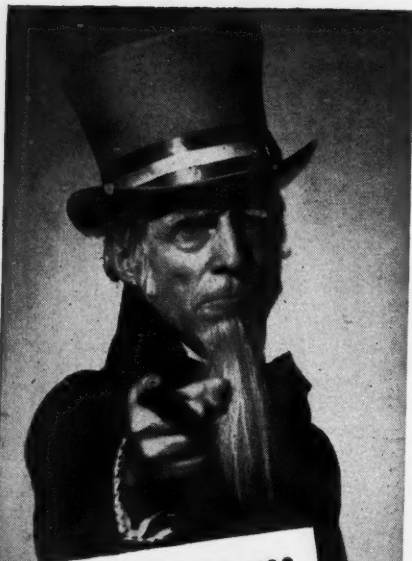
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tors it is best to dip the windings into the varnish, cleaning off the adjacent metal parts afterwards by using a solvent of the varnish. After applying the varnish, the best results are obtained by baking for a length of time recommended by the varnish manufacturer, which often is from 3 to 7 hours at about 100 degrees C.

If the machine must be put back in service quickly, or if facilities are not available for baking, fairly good results will be obtained by applying one of the quick-drying black or clear varnishes which dry in a few hours at ordinary room temperatures.

General Overhauling

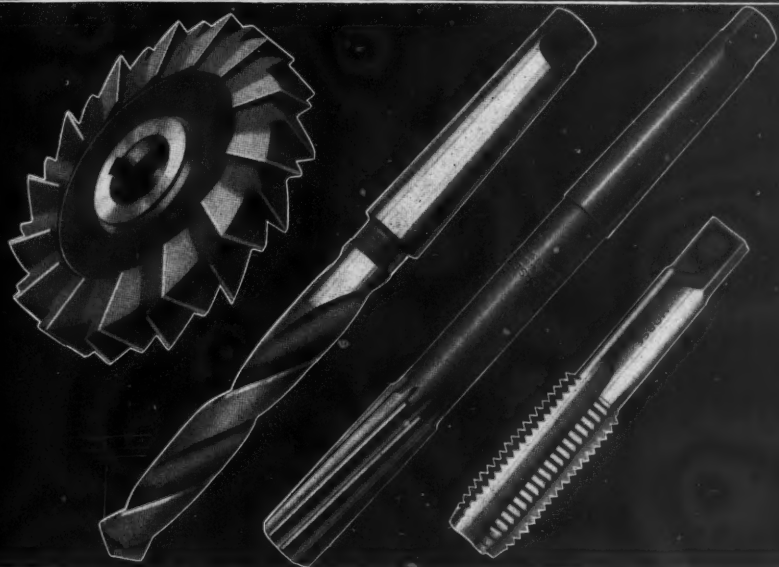
Motors should generally be given an overhauling at intervals of five years or so, or, if the service is more severe, more frequently. Such a practice is beneficial in avoiding breakdowns and in extending the useful life of the equipment.

Check the motor air gap between stator and rotor with feelers for uniformity. Small clearance at the bottom may indicate worn bearings.

Take the motor apart and inspect it thoroughly. Measurement of the bearings and journals may indicate need for new bearing linings. Remove the waste from waste-packed bearings and rearrange or replace it, so that any glaze on the wool is removed from its point of contact with the shaft. Any gummy deposit means that the wool should be replaced. All lubricant should be cleaned out of the bearings and a fresh supply put in when the motor is reassembled.

The rotors should be cleaned with a solvent to remove any accumulated dirt, after which any rust should be removed with fine sandpaper (not emery paper). When clean and dry, the rotors should be coated with a good grade of clear varnish or lacquer to protect them from moisture. To prevent injury to the bearings, they should be completely protected

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with a clean rag when the motor is disassembled.

The rotors of wound-rotor motors should be given the same treatment as the stators. In addition, soldered joints and binding cords should be inspected and any weakness remedied.

The stator bore should be cleaned of dirt with a solvent, and any rust should be removed with fine sandpaper (not emery paper). Care should be taken during this operation not to damage the top sticks or end turns of the stator winding. When the stator bore has dried, any remaining dirt in the bore should be wiped out with a cloth or brushed out with a soft brush. A hand bellows or dry compressed air at low pressure may also be used.

Additional Care for D-C Motors

To insure efficient operation of d-c motors, the following inspection and

servicing should be done systematically.

Brush Inspection

The first essential for satisfactory operation of brushes is free movement of the brushes in their holders. Uniform brush pressure is necessary to assure equal current distribution. Brush holders should be set so that the face of the holder is approximately $\frac{1}{8}$ in. up from the commutator; any distance greater than this will cause brushes to wedge, resulting in chattering and excessive sparking.

Check the brushes to make sure that they will not wear down too far before the next inspection. Keep an extra set of brushes available, so that replacement can be made when needed. Sand in new brushes, and run the motor without load as long as possible.

It is false economy to use brushes

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down to the absolute minimum length before replacement. Cases have been known where brushes have worn down until the metal, where the pigtail connects to the brush, was touching the commutator. This, of course, was causing severe damage to the commutator.

Make sure that each brush surface in contact with the commutator has the polished finish that indicates good contact, and that the polish covers all of this surface of the brush. Check the freedom of motion of each brush in the brush holder.

When replacing a brush, be sure to put it in the same brush holder and in its original position. It has been found helpful to scratch a mark on one side of the brush when removing it so that it will be replaced properly.

When installing new brushes, fit them carefully to the commutator. To do this, insert a strip of fine sand-

paper, sand side up, between the commutator and the brush. Rotate the commutator back and forth, allowing the brushes to bear on the sandpaper only when the commutator is moving in the proper direction of rotation.

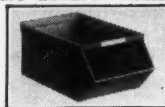
The brush should be lifted so it will not touch the sandpaper on the back pull. Sand only until the curve of the brushes is the same as that of the commutator. Be sure that brush shunts (pigtails) are fastened securely so that current will not overheat the brushes and brush holders.

Check the springs that hold the brushes against the commutator. Improper spring pressure may lead to commutator wear and excessive sparking. Excessive heating may have annealed the springs, in which case they should be replaced and the cause of heating corrected. Larger motors have means for adjusting the spring pressure, which should be

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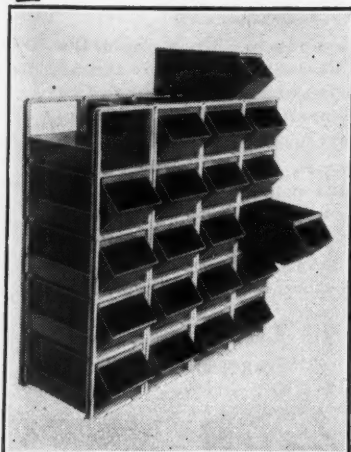
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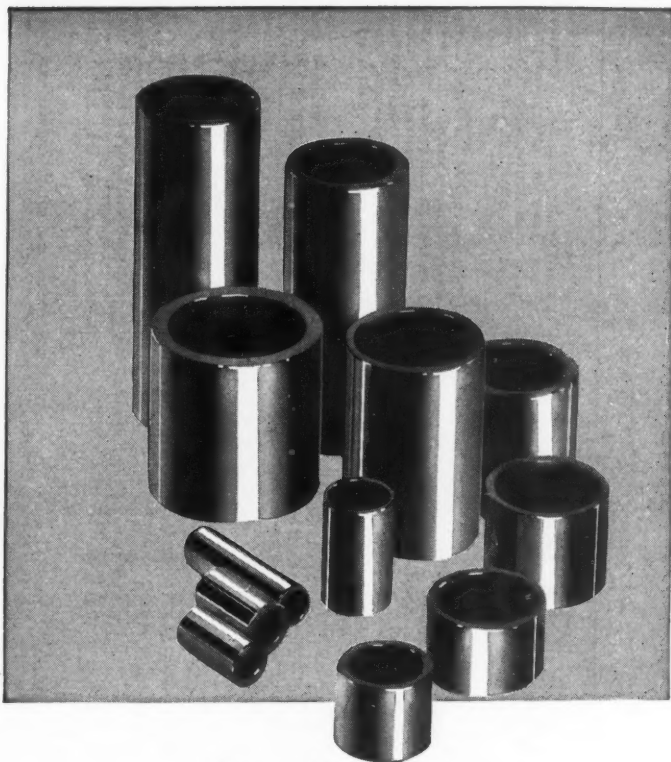
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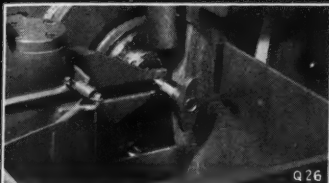
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TABLE I — CHARACTERISTICS AND APPLICATIONS OF POLYPHASE AC MOTORS

Polyphase Type	Rating Hp	Speed Regulation	Speed Control	Starting Torque	Pull-out Torque	Applications
General-purpose squirrel cage	0.5 to 200 hp	Drops about 3% for large to 5% for small sizes	None, except multi-speed types, designed for 2 to 4 fixed speeds	200% of full-load for 2-pole to 105% for 16-pole designs	200% of full-load	Constant-speed service where starting torque is not excessive. Fans, blowers, rotary compressors, centrifugal pumps, woodworking machines, machine tools, line shafts
Full-voltage starting, high sig. torque, low sig. current, squirrel cage	3 to 150 hp	Drops about 3% for large to 6% for small sizes	None, except multi-speed types, designed for 2 to 4 fixed speeds	250% of full-load for high-speed to 200% for low-speed designs	200% of full-load	Constant-speed service where fairly high starting torque is required at infrequent intervals with starting current of about 400% full load. Reciprocating pumps and compressors, conveyors, crushers, pulverizers, agitators, etc.
Full-voltage starting, high-starting torque, high-slip, squirrel cage	0.5 to 150 hp	Drops about 7 to 12% from no load to full load	None, except multi-speed types, designed for 2 to 4 fixed speeds	300 to 315% of full-load, depending upon speed and rotor resistance	300%. This motor will usually not stall until loaded to its maximum torque, which occurs at standstill	Constant-speed service and high starting torque if starting not too frequent, and for taking high-peak loads with or without flywheels. Punch presses, die stamping, shears, bulldozers, balers, hoists, cranes, elevators, etc.
Wound-rotor, external-resistance starting	0.5 to several thousand	With rotor rings short-circuited, drops about 3% for large to 5% for small sizes	Speed can be reduced to 50% of normal by rotor resistance. Speed varies inversely as the load	Up to 300% depending upon external resistance in rotor circuit and how distributed	200% when rotor slip rings are short-circuited	Where high starting torque with low-starting current or where limited speed control is required. Fans, centrifugal and plunger pumps, compressors, conveyors, hoists, cranes, ball mills, gate hoists, etc.
Synchronous	25 to several thousand	Constant	None, except special motors designed for 2 fixed speeds	40% for slow-speed to 160% for medium speed designs. Special high-torque designs	Unity-pf motors 170%; 80% = pf motors 225%. Special designs up to 300%	For constant-speed service, direct connection to slow-speed machines and where power-factor correction is required.

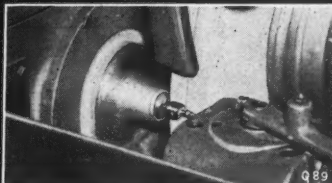
TO FINISH THE JOB QUICKER . . .

GRIND SMALL CAMS WITH EQUIPMENT LIKE THIS



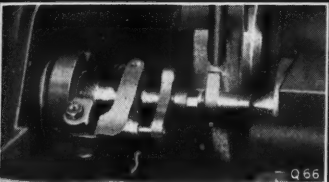
Q26

An ignition timing cam being ground on a Landis 6 x 18 Type C Plain Grinder using a loose cam grinding attachment.



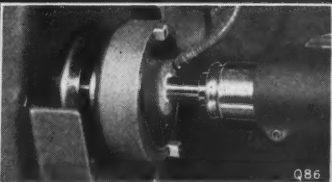
Q89

A small roller being relief ground on a Landis 6 Type C Plain Grinder equipped with an integral cam grinding attachment.



Q66

A small integral cam being ground on a Landis 12 x 36 Type LC Universal. An integral cam grinding attachment is used.



Q86

A cam used in the manufacture of aircraft being internal ground on a 12 Type LC Universal, using a loose cam grinding attachment.

Why invest in costly specialized equipment for the grinding of small cams when you can perform the same operations on Landis Cam Grinding Attachments such as those

shown above. When not in use, the attachment can be removed and the otherwise perfectly standard machine can be used for conventional operations.

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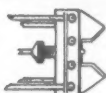
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TABLE II — CHARACTERISTICS* AND APPLICATIONS OF DC MOTORS, 1 to 300 HP

Type	Starting Duty	Maximum Momentary Running Torque	Speed Regulation	Speed Control †	Applications
Shunt-wound, constant-speed	Medium starting torque. Varies with voltage supplied to armature, and is limited by starting resistor to 125 to 200 per cent full-load torque	125 to 200 per cent. Limited by commutation	8 to 12 per cent	Basic speed to 200 per cent basic speed by field control	Drives where starting requirements are not severe. Use constant-speed or adjustable-speed, depending on speed required. Centrifugal pumps, fans, blowers, conveyors, elevators, wood- and metal-working machines
Shunt-wound, adjustable-speed				Basic speed to 600 per cent basic speed (lower for some ratings) by field control	
Compound-wound, constant-speed	Heavy starting torque. Limited by starting resistor to 130 to 260 per cent of full-load torque	130 to 260 per cent. Limited by commutation	Standard compound-winding 25 per cent. Depends on amount of series winding	Basic speed to 125 per cent basic speed by field control	Drives requiring high starting torque and fairly constant speed. Pulsating loads. Shears, bending rolls, plunger pumps, conveyor crushers, etc.
Series-wound, varying-speed	Very heavy starting torque. Limited to 300 per cent full-load torque	300 to 350 per cent. Limited by commutation	Very high. Infinite no-load speed	From zero to maximum speed, depending on control and load	Drives where very high starting torque is required and speed can be regulated. Cranes, hoists, gates, bridges, car dumpers, etc.

† Minimum speed below basic speed by armature control limited by heating.

* Table shows average values for standard motors.

to 2½ lb. per sq. in. of area of brush contact with the commutator.

Commutator

Inspect the commutator for color and condition. It should be clean, smooth, and a polished-brown color where the brushes ride on it. A bluish color indicates overheating of the commutator.

Roughness of the commutator should be removed by sandpapering or stoning. Never use emery cloth or an emery stone. For this operation, run the motor without load. If sandpaper is used, wrap it partly around a wood block.

The stone is essentially a piece of grindstone, known to the trade as a commutator stone. Press the stone or sandpaper against the commutator with moderate pressure with the motor running without load, and move it back and forth across the commutator surface.

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Use care not to come in contact with live parts. If the armature is very rough it should be taken out and the commutator turned down in a lathe. When this is done, it is usually necessary to cut back the insulation between the commutator bars slightly. After turning down the commutator, the brushes should be sanded and run in as described previously. This is not necessary after light sandpapering or stoning.

Never put oil on the commutator. Proper selection of brushes gives the commutator all the lubrication required to prevent excessive wear and to build up a good smooth operating glazed surface on the copper. The addition of oil results in the development of a high resistance film which may cause undue heating and rough brush action. The oil will also have a detrimental effect on the internal parts of the commutator.

Economy Grinding Oils and Lubricants for precision grinding are treated in a 32-page booklet issued by The White & Bagley Co., Worcester, Mass. The uses of these oils and lubricants on various types of well-known grinding machines are illustrated and described throughout the booklet, copy of which is available free upon request.

Westinghouse Sequence and Automatic Weld Timers are described and illustrated in a six-page booklet announced by the Westinghouse Electric & Mfg. Co. Designated as the B-3079, the booklet covers special design features of the timers and gives application information. Also included are diagrams showing complete sequence of operation in pulsation welding and how the electronic timer and other controls fit into the average resistance welding circuit. Two tables, one for automatic weld timers and the other for sequence timers, are contained in the booklet, giving the N.E.M.A. type number, type of welding, operation, timing function, and rating of timers.

Copy of Booklet B-3079 can be obtained from Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pennsylvania.

WELDING ELECTRODES ARE SCARCE

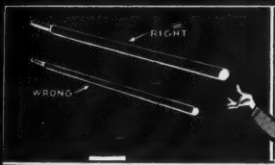
*"Make 3
do the
work of 4"*



**Don't bend Electrodes
unless necessary...**



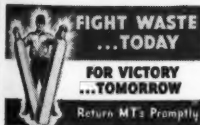
**Don't leave more
than 2" Stub...**



**Use largest effective
diameter electrode**



**Make face of fillet welds
flat...the legs equal**



A booklet of shop bulletins illustrating "do's and don'ts" has been prepared. We'll gladly send you as many copies as you can use.

We can all prevent waste of valuable welding electrodes by following these and other simple, common sense suggestions. 25% to 30% more welding can, and must, be obtained from available electrodes.



60 EAST 42nd STREET, NEW YORK, N.Y.

In Texas: Magnolia-Airco Gas Products Co.

WASTE CYLINDERS ARE PRODUCTION SLACKERS: KEEP 'EM ROLLING FOR VICTORY!



Army Air Force Generals Inspecting Various Stages of Production of Airplane Propeller Made from Seamless Steel Tubing. Left to Right: William F. Wise, President of American Propeller; Brigadier General A. W. Vanaman, Commanding Officer of Wright Field; Brigadier General K. B. Wolfe, Chief of the Production Division of the U. S. Army Air Forces

Propeller Blades from Steel Tubing

Alloy Used that is Resistant to Corrosion and Abrasion

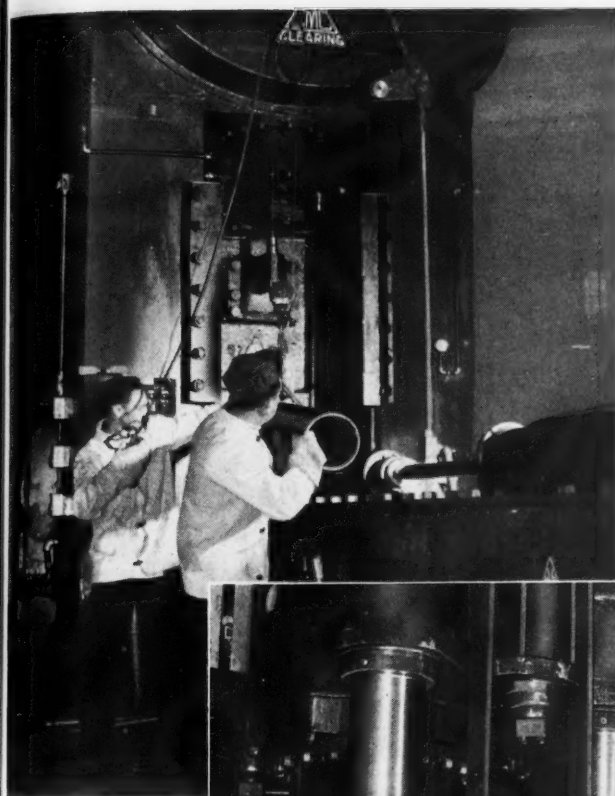
SOMEWHERE in the Middle West, on May twentieth, a huge new plant for the production of airplane propeller blades was dedicated. Built for the American Propeller Corporation, the plant is said to be the first built for the mass production of propeller blades by the unique method of

processing them out of single pieces of seamless steel tubing.

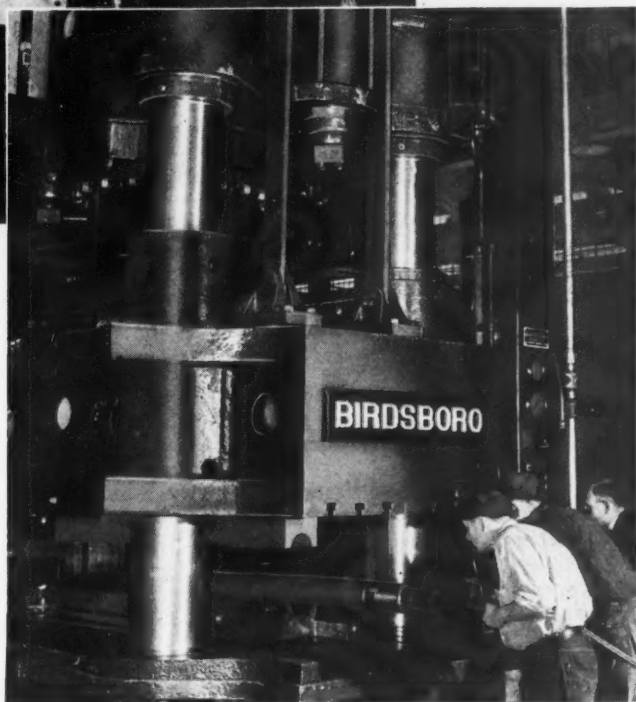
Stephen T. Early, Secretary to President Roosevelt and present to represent the White House, Brigadier General A. W. Vanaman, Commanding Officer of Wright Field, Dayton, Ohio, and Brigadier General Kenneth

One of the Battery of Four Huge Swaging Presses used to Reduce the Section of Steel Tubing to the Desired Size at the Assembly End. Said to be the Largest Mechanical Presses Ever Built, Each Press Weighs Well Over 250 Tons. The Operators Wear Asbestos Coats and Gloves While Handling the Heated Tubing

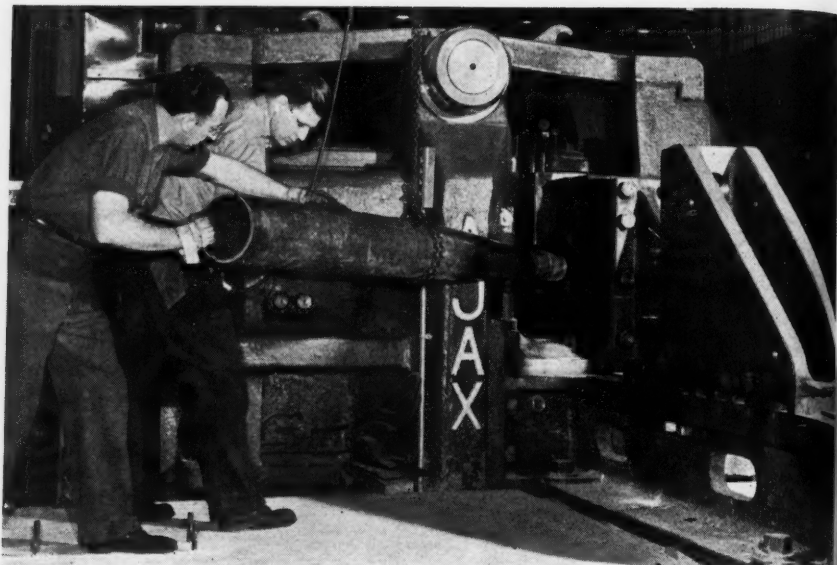
The event marked an important milestone in airplane propeller history, since the process of making a hollow steel blade out of a single



B. Wolfe, head of the Production Division of the U. S. Army Air Forces, were among those who took part in the ceremony.



Forming a Propeller Blade in a Giant Birdsboro Press. Each Blade is filled with Gas Before Forming, to Insure Proper Shaping. Note the Gas Connection on the End of the Tube Section



Here a Swaged Section is Being Placed in an Ajax Forging Furnace for Further Shaping

piece of seamless tubing is more adaptable to mass production methods than other processes and promises to prove better, cheaper and faster. Each section of steel tubing is transformed into a blade by a series of hot forging, cold pressing, machining, and welding operations, several of which are shown here.

Research work on the process was begun at the plant of the Lycoming Division of the Aviation Corporation in 1935. American Propeller is a subsidiary of the Aviation Corporation.

The steel blades are lighter than aluminum in the larger sizes and present greater resistance to corrosion and abrasion. Actually, the metal is a special chromium-molybdenum alloy that is very difficult to work but which gives the blades superior physical properties and increased strength against fatigue.

The equipment includes four of the largest mechanical presses ever built—giant machines that weigh more

than 500,000 tons each. The material is received from the tube mill cut to length, each piece being 8 feet 6 inches long. The order number and engineering specification number is stenciled on each piece.

Before any forming is done on the piece, it is finished all over by grinding on both the inside and outside. Dimensions are held fairly close, so as to obtain uniform wall thickness. A hone is used to impart the final finish to the interior surface, while the cylindrical grinder serves for the exterior.

In the next operation the tube is swaged to reduce the diameter at one end to the size desired. This done, it is polished and is then sent to a huge press where it is flattened according to specifications. In the next operation, which is also done in a giant press, the blade is formed to shape. In the final machining operation the blade is trimmed, after which it is polished and lacquered.

War Boat Builders SPEED Production WITH VAN DORN

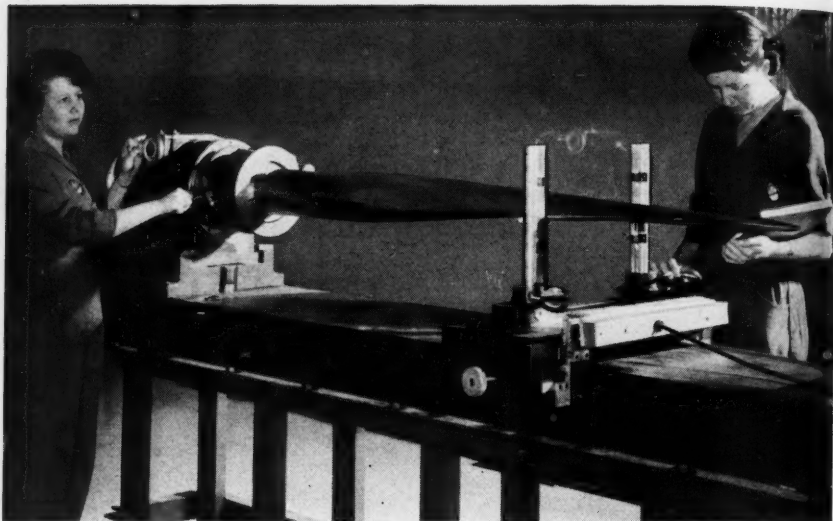


CONVERTING to naval cargo-ship funnels from store fixture manufacture, one war producer tested various portable electric tools. *He chose Van Dorn as the most efficient.* The same experience was duplicated by a manufacturer of wooden marine craft.

Van Dorn's unusually complete line of drills, sanders, grinders, nut runners—

tools for every kind of production and assembly job—give you the right tool for your special spot. They're powered for non-stop production lines. And they're backed by Van Dorn's 26 Factory-owned Service Branches—largest in the industry. Call your Van Dorn jobber, or write The Van Dorn Electric Tool Co., 720 Joppa Road, Towson, Maryland.

"Van Dorn"
(DIV. OF BLACK & DECKER MFG. CO.)
PORTABLE ELECTRIC TOOLS

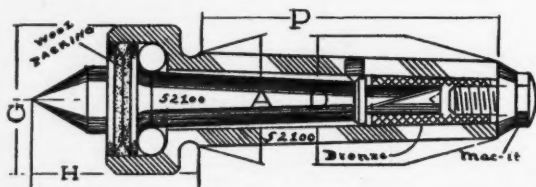


Each Finished Blade is Carefully Inspected and Checked for Accuracy in this Inspection Machine. While One Operator Revolves the Blade so that All Parts of the Blade can be Checked, the Other Operator Measures the Blade at Predetermined Points on the Contour. Magnifying Glasses Aid in Reading the Vernier Scales

Each blade is carefully inspected and checked all over before being released for service. The dimensions and contour are checked for accuracy in a special inspection machine in which the blade can be revolved to any position in the horizontal plane. A carriage on the machine is equipped with vertical contact edges controlled by a cross feed. Graduated scales are provided from which readings can be taken at various points on the

edges of the blade, magnifying glasses being used to aid in reading the scales. The readings must check with specifications within close limits of accuracy.

Konag "F," an all-purpose colloidal natural graphite additive for lube oils and many greases is the subject of Bulletin No. 4 now being issued by the Industrial Division, National Graphite Co., Inc., 17 John St., New York, N. Y. Copy free upon request.



"Manufacturing for 30 years without knowing that we needed live centers, until we saw the Rigid. Now we have 10 in use."

RIGID TOOL CO. • 2010 Witherell St., Detroit, Michigan

NEW! SMALLEST IMPACT TYPE WRENCH

**FAST APPLICATION, REMOVAL
OF NUTS UP TO 1/4" BOLT SIZE**

Angle and Straight Models

NEW YORK (CP) — Chicago Pneumatic Tool Company, manufacturers of the largest line of impact type pneumatic wrenches, now offers the smallest pneumatic wrench—CP 337-R.

Ideal for driving elastic stop nuts, the new wrench speeds application and removal of all nuts up to 1/4" bolt size. 45° and 90° angle types are available for hard-to-get-at nut running. Write for complete information.

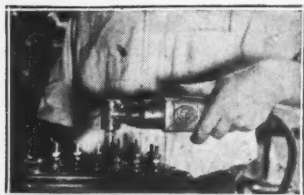
**CHICAGO PNEUMATIC
TOOL COMPANY**

General Offices: 8 E. 44th St., New York, N. Y.



↑ **ONLY 5 1/2" LONG**, weighing only 2 pounds, Chicago Pneumatic 337-RS is the smallest impact type pneumatic wrench.

FOR FAST WORK → in hard-to-get-at places, there's a 45° model of this new impact type wrench, the CP 337-RAF.



↑ **APPLYING 3 NUTS PER POST**, 24 posts, on an assembly job with the right angle drive CP 337-RAN Impact Type Wrench.

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ALSO: Air Compressors, Electric Tools, Rock Drills, Hydraulic Aviation Accessories, Diesel Engines

WRENCHES
DRILLS
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RIVETERS
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GRINDERS

Salt,

By ALBERT W. GRAY

Sweat and Fatigue

The physical condition of the worker — always a factor in production — is especially important in these days when the future of the nation depends upon our ability to produce

H EAT prostration is a factor that has always had to be reckoned with in industry when operations were carried on in the presence of furnaces or ovens, or where climatic temperatures become critical at certain seasons of the year. As a matter of fact, until recent years a certain number of heat casualties was considered inevitable where such conditions prevailed.

More recently, however, an effort has been made to deal with this matter scientifically and it has been discovered that the real reason for the collapse of workers working in the vicinity of furnaces and ovens has been the loss of salt from the body through excessive perspiration.

The need of salt in the human system is a basic need of the human race. This need that man still shares with the lower animals has far outlasted the simian tale of his furred ancestors.

A man who is exerting himself physically in an atmosphere of unusual heat will lose moisture at a rapid rate in the form of perspiration which exudes through the pores of

the skin. As the moisture seeps through, it carries with it a certain amount of salt. The worker will, intermittently, replenish the moisture supply at the water fountain, but in many cases he fails to replenish the salt supply also. Unless the salt in the body is maintained at a given percentage, eventually the worker will suffer breakdown from exhaustion or "heat cramps" and becomes a liability instead of an asset.

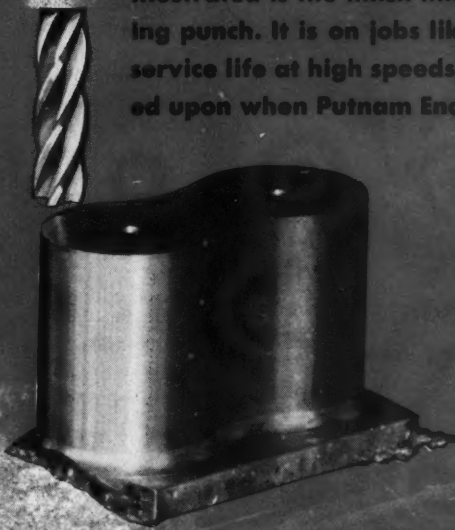
One of the earliest of the research works on industrial fatigue was undertaken a little more than a year ago at the Barro Colorado Island Biological Laboratory in the Panama Canal Zone. In that country the temperature is neither high nor variable. The atmosphere, though, is saturated with water. Working under these conditions a workman gains no relief by a lowered bodily temperature produced by the evaporation of sweat.

Under normal atmospheric conditions sweat evaporation serves to decrease the body temperature. In the absence of such evaporation normal processes for the dissipation of bodily heat are nullified. Evaporation can-

HIGH SPEED FINISH MILLING With Rotary Head Motion

With Putnam Hi-Speed End Mills, exceptional finishes can be secured with the milling operation alone. The design and quality of these tools make them especially adaptable to all operations where high spindle speeds, precision movements and Rotary Head motion are involved.

Illustrated is the finish milling of a blanking punch. It is on jobs like this that long service life at high speeds can be depended upon when Putnam End Mills are used.



PUTNAM *Hi-Speed* END MILLS

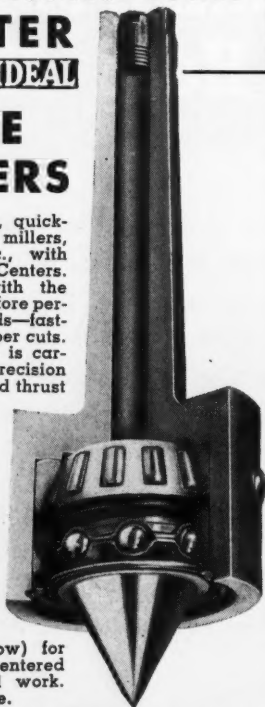
PUTNAM TOOL CO. • 2981 Charlevoix Ave. • Detroit

Turn Heavier Loads FASTER WITH IDEAL LIVE CENTERS

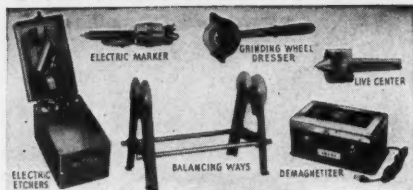
Get more work, quicker, out of lathes, millers, grinders, etc., with IDEAL Live Centers. They rotate with the work, and therefore permit heavier loads—faster speeds—deeper cuts. The radial load is carried by a high precision ball bearing, and thrust load absorbed by a taper roller bearing. All parts are hardened and ground.

TRIPLE DUTY

Three Inter-changeable Center Pieces (illustrated below) for all kinds of centered and uncentered work. Save set-up time.



OTHER PRODUCTION SPEEDERS



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Descriptive Literature

IDEAL COMMUTATOR DRESSER CO.

1031 PARK AVENUE SYCAMORE, ILLINOIS

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not occur in an already saturated atmosphere.

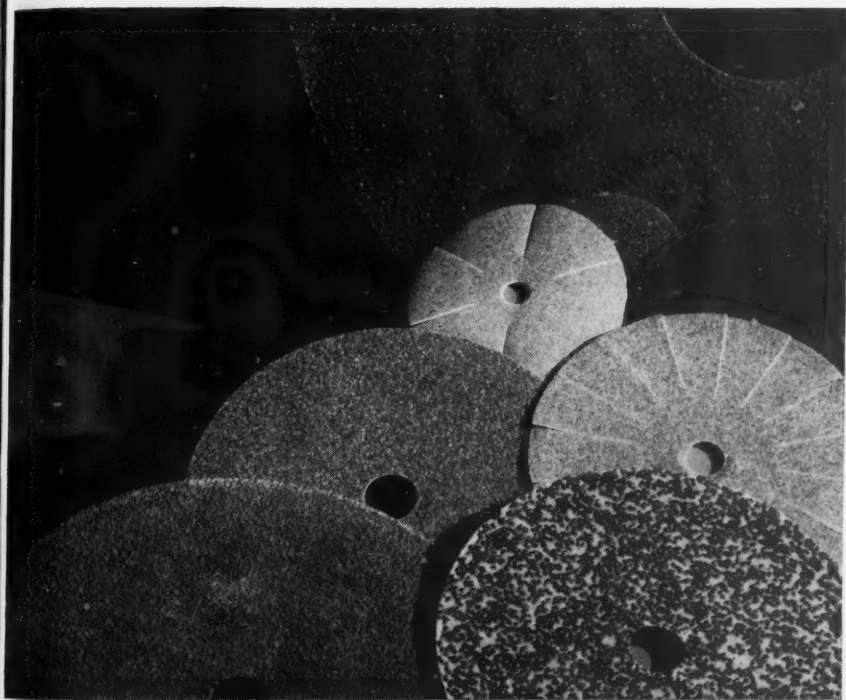
In the investigation of fatigue causes, a man was loaded with a pack and told to walk at the rate of two and a half miles an hour for three hours with a ten-minute rest period once every hour. At the end of three hours his pulse was from 110 to 115. The man then made the same walk with the same load and rest periods, clothed in a heavy woolen uniform. This type of clothing reproduced the atmosphere of the tropics and prevented the evaporation of the sweat as does a damp tropical atmosphere. At the end of the three hours his pulse was 175.

In the effort of his system to throw off the heat and overcome the unusual condition blood was drawn to the skin and away from the muscles where it normally supplied the oxygen consumed by physical activity. The result was excessive heart action, strain and ultimately would have resulted in collapse.

This situation arose in efforts made by the Chemical Warfare Service to work out a protection from mustard gas. The task was to find some clothing light in weight that would prevent the contact of this gas with the skin. It was found that these characteristics could be combined in a suit of light oil-skin, but the skin restrained the evaporation of sweat and thus prevented the reduction of skin temperature. The wearers of the clothing moved in an atmosphere that was identical with the heat and humidity of the tropics. The heart action increased dangerously, with a corresponding rapid decline in energy.

The result of the prevention of sweat evaporation from the skin is clearly described by Dr. Dill of Harvard University as follows: "A man doing heavy work in the tropics of the United States during hot, humid weather has a much higher heart rate than would be the case if he were

FOR EVERY TYPE of grinding or polishing job...there is a Jewel Coated Abrasive that will do it quicker, better and more economically. The complete line includes special and standard shapes in a wide range of grits, grades and backings. It will pay you to investigate Jewel Coated Abrasives now.



JEWEL ABRASIVES

Made by Abrasive Products, Inc., South Braintree, Mass.

doing the same sort of work in a pleasant environment. In part, the explanation of his high heart rate is that if the body temperature is to be controlled, heat must be transferred from the regions where it is produced to the regions where it is dissipated. This transfer is effected in times of stress chiefly by the circulation of the blood to the skin. The blood is diverted from its usual channels and functions for this special purpose, during which it is not available for other purposes. Accordingly, an increased strain is placed on the heart."

When the skin temperature rises to body temperature, the vessels of the skin are dilated, drawing the blood to the surface and thus removing the oxygen supply needed by the muscles for energy.

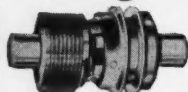
In 1931, in the construction of Boulder Dam, heat prostrations and deaths were of frequent occurrence among the workmen. The dormitories

where the workmen were housed had been erected in a river canyon. There the temperature, even in the shade, often remained above a hundred degrees until after midnight; sometimes during the day rising as high as 125 degrees Fahrenheit.

Investigation by the Secretary of the Interior showed that at this high altitude the free sweat evaporation prevented any abnormal heart action with its consequent exhaustion. Nevertheless, in this unrestricted sweat evaporation the salt reserve of the body suffered a dangerous reduction. The depletion of the bodily salt reserve resulted in break downs and heat cramps and a consequent death toll that bid fair to become a public scandal.

Later, heat exhaustion studies were made in a large midwestern steel mill and the conclusions of the scientists were: "In critical or severe cases, a salt solution should be injected under the skin or into the blood stream. In

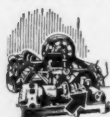
Pulling For Victory In Industrial Drives



Single-Type Pullmore

PULLMORE Multiple-Disc

Used in machine tools, process machinery, hoisting mechanisms, all multiple-disc clutch services.



Double Type Pullmore

Rockford Clutches

Rockford Clutches pull for Victory in many kinds of production and power equipment; promoting peak output of armament, food, machinery, materials, other

war-essentials. Panels at right and left show typical Rockford Clutches; suggest a few of many uses. Highly efficient and durable, compact, accurately made, listed in many standard sizes; Rockford Clutches simplify designing and installation, save every day.

Pullmore Clutches meet all multiple-disc requirements up to 90 h.p. at 500 r.p.m. Unexcelled for high speeds, compact space.

Rockford Plate Clutches, Over-Center and Spring-Loaded, effectively handle applications from 1 to 80 h.p. at 100 r.p.m. Investigate also **Rockford Power Take-Offs** for S.A.E. housings. Details on request.



O-C and Spring-Loaded

PLATE CLUTCHES

Used in tractors, power units, shop trucks, locomotives, conveyors, many other industrial drives.



Power Take-Offs

ROCKFORD DRILLING MACHINE DIVISION Borg-Warner Corporation

▼ 300 CATHERINE STREET, ROCKFORD, ILLINOIS, U. S. A. ▼

Over-Center Clutches • Spring-Loaded Clutches • Pullmore Clutches • Power Take-Offs

THE WHEEL BEHIND THE PLANE

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Research, engineering, rigid control of materials and manufacturing operations share equally in the job of making BAY STATE Grinding Wheels and Stones the superior abrasive products to speed production and improve quality of finish on numerous vital airplane parts so necessary to the ultimate Allied Victory.

Bay State Abrasive Products Co., Westboro, Mass., U. S. A.

mild cases salt can be taken by the mouth."

Further, it was found difficult to place any dependence on the voluntary consumption of the necessary salt ration by workmen. Among many was a belief that salt endangered the kidneys; in other instances it was found impossible to eradicate a belief in the preventative power of sulphur. One workman was wearing a small bag of sulphur around his neck; an-

other had poured sulphur into his shoes. The remedy adopted was a small quantity of salt in the drinking water. With the proper consumption of salt water, the salt problem takes care of itself.

Later the medical officer in these steel mills stated that since the adoption of salt rationing, heat prostrations had been "considerably reduced," with practically no cases of cramps.

The president of the Nassau Smelting and Refining Company, commenting on the effect of salt, said that formerly, in extremely hot weather, cramps and heat prostrations were almost of daily occurrence among the men working on furnace operations, but after the adoption of a salt ration, there had not been for two summers a single case of prostration or cramps.

The conclusions of these researches are set forth in a recent publication of the National Research Council: "First, that a man in mid-winter or early in the season has a lower capacity for sweating than when he has been in a high temperature for several days and, second, that the salt concentration in sweat falls off during the period of adaptation. It may fall off by one-half in a season. A man can do harder work after adaptation because more sweat is produced and his body temperature is regulated more effectively. As the summer advances, he is less likely to break down because the sweat he produces contains less salt and his thirst maintains the body fluids."

"Blueprint for Industry," a four-page bulletin containing engineering information on the Metal Equipment Continuous Air Draw Furnace and Thermal-Shock Machine for 20, 37, 40, and 75 mm. and 3-inch armor piercing shot is now being issued by The Metal Equipment Co., Industrial Oven Engineering Division, 2032 W. 105th St., Cleveland, Ohio. Copy free upon request.

Welders for Defense



Any two Knock-Out welders can easily be connected in series to combine the amperage of both machines for occasional jobs requiring large capacity. Separated, they can be used on different jobs within their capacity.

Write or Wire for Bulletin W42-7M

K. O. Lee Company
Aberdeen, South Dakota

MASONITE* DIE STOCK

ACCURATE, DURABLE, PERMANENT

WIDELY used by aircraft builders in the manufacture of dies and fixtures for processing sheet metal, Masonite Die Stock also makes an accurate work surface for the assembling of bulkhead fixtures.

This smooth, durable material combines light weight with great strength, gives long service at low cost. It can be drilled, tapped, and will stand abrasion. Fixtures can be moved easily.

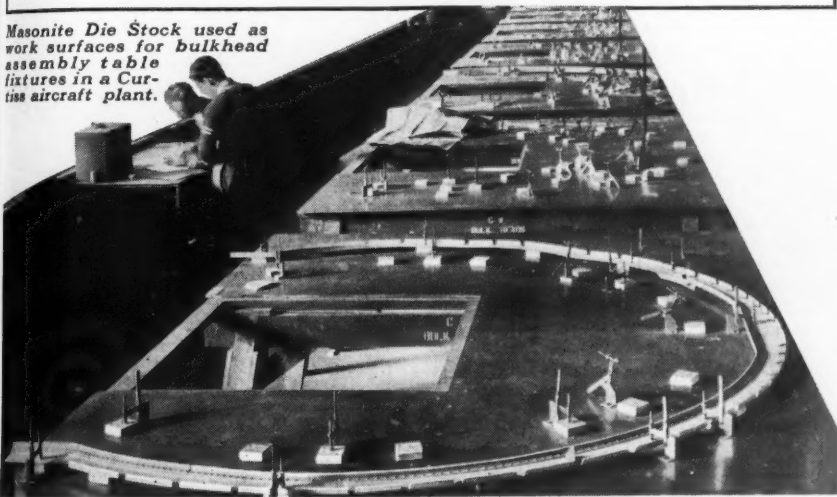
A highly moisture-resistant material without the grain of natural wood,

Masonite Die Stock has inert qualities similar to metals, yet can be installed with wood-working equipment.

While its most spectacular success is being demonstrated in the aircraft industry today, Masonite Die Stock is also being used by other manufacturers where accuracy, durability and permanence are required.

Masonite Die Stock is available in thicknesses of $\frac{1}{4}$ to 2 inches... in sizes of 48 x 72 inches and 48 x 144 inches. For further details, fill out and mail coupon below.

Masonite Die Stock used as work surfaces for bulkhead assembly table fixtures in a Curtiss aircraft plant.



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MASONITE CORPORATION

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Please send me illustrated literature and complete information about the new Masonite Die Stock.

Name and firm _____

Address _____

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ON THE JOB EVERY DAY

A Duty Code for the

"MAN BEHIND THE MAN BEHIND THE GUN"

As an American workman, conscious of my obligation to the men of the armed forces who are risking their lives that my freedom may endure, I solemnly declare and affirm that —

1. I will be at my job every scheduled day, my health permitting.
 2. I will safeguard my health in my hours off the job, so that absence from work will not result from intemperance or neglect of my physical condition.
 3. I will not, without due notice, absent myself from my work and thus cause to stand idle any equipment which might otherwise be producing its full capacity of urgently needed war materials.
 4. When absence is unavoidable, I will notify my foreman in advance, that he may make provision to maintain uninterrupted production on my job.
 5. I fully understand that absence from my essential work may jeopardize the life and safety of a friend, a relative, or a friend's son who has taken his place in the face of the enemy.
 6. I affirm that I shall be unworthy of my rights as an American citizen if I become negligent in regular attendance on my job.
 7. I will be guided by the full realization that if I do not do my share to produce for victory, my fellow workers may regard me as one who shirks his duty in this fight for freedom.
 8. I know how gigantic is the task of myself and my fellow workmen in matching the production of the enemies of my country and my people.
 9. I cannot expect, nor shall I deserve, the respect and the friendship of my fellow Americans if I do not take seriously my responsibility to be punctual and regular in my attendance at work.
 10. Even though my individual job may be small, I realize that it is essential.
 11. I appreciate the fact that, if I am undependable and irregular in attendance at my work, I may help to bring upon myself and my faithful fellow workers inevitable regulations which would deprive all who work of certain freedoms and privileges which we now enjoy.
 12. My sense of duty to my country will not permit me to shirk the work which I am now called upon to do to protect this country which has given me a better way of life than workers enjoy anywhere else in the world.
 13. I will do my part to convince other workmen who may be indifferent to the need of regular attendance at work that America deserves their faithful service.
 14. I will regard as unfair to me the negligence of a fellow worker who may, by his absence from work, prevent me from doing my full duty.
 15. I re-affirm my faith in America and dedicate myself to the regular, punctual and dependable performance of my full share of the work required to make my country "the arsenal of democracy," the liberator of oppressed people throughout the world, and the defender of freedom.
- Therefore, I take as my pledge the voluntary pledge of that hero of the first World War who, before he died in battle, inscribed in his diary these words:
- "America must win this war. Therefore, I will work, I will save, I will sacrifice, I will endure. I will fight cheerfully and do my utmost, as if the issue of the whole struggle depended on me alone."**

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★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

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THE a
similar
what adv
lighting
giving the
If your p
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chinery, c
(fluoresce
the answer
See your
Dept. 166

Production Up... Rejects down with G-E Fluorescent Lighting!

CASE NO. 51

Inspection department of a war industry plant. Since new fluorescent lighting was installed, inspection of small parts has been speeded up . . . errors reduced, and production increased. Better lighting helps workers see faster with less fatigue.

THE actual case described above is only one among scores of similar cases studied by General Electric to show specifically what advantages better lighting . . . in this case, G-E Fluorescent Lighting . . . offers industrial plants. War restrictions prevent giving the name and location of this factory.

If your plant is faced with the problem of how to get more and better war production without adding any extra floor space, machinery, or workmen, cool indoor daylight with G-E MAZDA F (fluorescent) lamps in certified fluorescent lighting fixtures may be the answer.

See your G-E lamp supplier or write General Electric Company, Dept. 166-MM-7, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS
GENERAL  ELECTRIC

*Want maximum
light for the cur-
rent consumed?
Then look for the
G-E monogram
on the lamps you
buy.*

(Left) Under Secretary of the Navy James V. Forrestal, speaking in behalf of the Navy. (Right) Col. E. S. Reimel, Army and Navy Munitions Board, Washington, D. C., making formal presentation speech of the Joint Army and Navy Burgee to the Cleveland Twist Drill Company and employees.



Cleveland Twist Drill Company Gets First Joint Army-Navy Award

The first concern in the United States to receive the Joint Army-Navy Award for outstanding service in war production, The Cleveland Twist Drill Company, Cleveland, Ohio, was the recipient of this award on Friday, May 22nd. The Award consists of a naval burgee having a blue background with the words ARMY and NAVY in red and a large white star in the center.

The presentation ceremonies were colorful and impressive, and were witnessed by some 1,600 employees of the company. The Mayor of Cleveland, Hon. Frank J. Lausche, presided. The presentation speech was made by Col. E. S.

Reimel of the Army and Navy Munitions Board, and the award, presented by Capt. E. B. Almy, Coordinator of Machine Tools, U. S. Navy, Washington, was received by President Jacob D. Cox and a representative of the employees, Clarence Stiegelmeier.

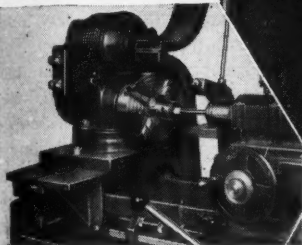
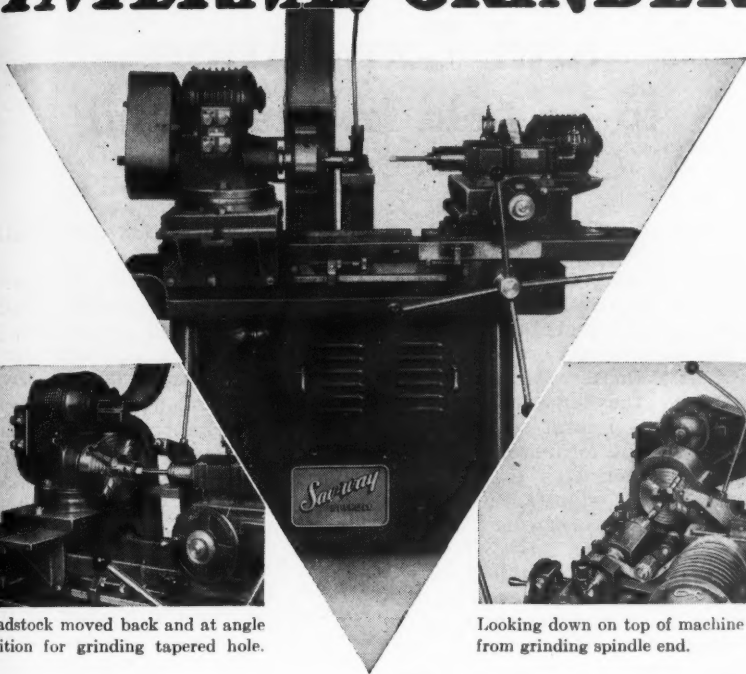
Hon. James V. Forrestal, Under Secretary of the Navy, also spoke, outlining the part that Cleveland Twist Drill Company has been playing in the war effort.

Mr. Forrestal pointed out the vital importance of cutting tools not only in the production of machine tools but also in the production of tanks, gunships, and many other war materials.

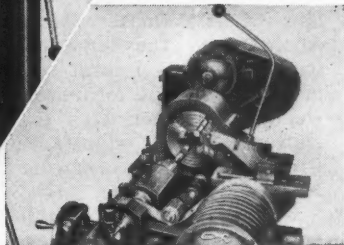


Army and Navy Burgee presented to the Cleveland Twist Drill Company, Friday, May 22, 1942. (Left to right) Clarence Stiegelmeier, representing the employees; Capt. E. B. Almy, United States Navy, President J. D. Cox, representing the Company.

Saw-way MULTI-PURPOSE **INTERNAL GRINDER**



Headstock moved back and at angle position for grinding tapered hole.



Looking down on top of machine from grinding spindle end.

Offers greater flexibility . . . a

precision grinder, designed and built by engineers with years of practical experience to guide them . . . has a headstock traverse of 6" . . . grinds holes $\frac{1}{4}$ " to 18" in diameter . . . holes up to 9" deep, straight or tapered . . . entire headstock may be moved at right angle to wheel traverse, by merely loosening two conveniently located nuts . . . worm compensating device permits grinding wheel head adjustment to .0001 . . . sturdy construction throughout . . . full specifications, delivery time and price on request.

Distributors throughout the U. S. and Canada to serve you.

***Saw-way* TOOL AND MACHINING CO.**
13840 JOS. CAMPAU AVE. DETROIT, MICHIGAN

National Metal Congress and Exposition to be held in Cleveland week of October 12th

CHARGED with the basic job of war production, the metal manufacturing industry must seek suggestions for improvements in design, in manufacture, and in processing that will ensure an ever-increasing flow of vital materials for victory. Accordingly, the American Society for Metals will present at the Cleveland Public Auditorium, during the week of October 12th to 16th, the National Metal Congress with a War Production Edition of the National Metal Exposition.

Feeling that the Metal Congress and Exposition can be of even greater service to the Metal Industry and to the Nation at this time than ever before, the Congress is intended to provide a common meeting place where executives, production men and engineers can discuss ways and means for

increasing production and quality of war materials.

The meeting will be a 100 per cent educational demonstration clinic devoted to increased production, planning, engineering, improvement of materials, job training, conservation, substitution and maintenance.

New and improved materials and equipment will be displayed, explained, and demonstrated. The executives, technical men and sales engineers who will be in attendance will contribute far more in service to the industry in one week at the Congress than they could in months of traveling for individual service contracts.

The A. S. M. and cooperating societies join with the metal industry in dedicating their every effort for one purpose—Production for Victory.

Machine Tool Deliveries Continue To Rise

The value of new machine tools, presses, and other metal working machinery shipped during April was \$114,100,000, it was announced May 30th by Production Director Harrison.

Shipments of machine tools alone amounted to 25,415 units, with a total value of \$103,364,496. During March, 24,300 units, valued at \$98,358,299 were shipped.

Union Chucks. A 64-page plastic bound catalog covering a complete line of manually and power-operated chucks has been published by the Union Mfg. Co., New Britain, Conn. The catalog includes descriptive, tabular, and illustrated information on various types of independent chucks, geared scroll chucks, geared screw chucks, two-jaw chucks, revolving jaw (valve) chucks, planer chucks, boring mill chucks, drill chucks, power chucks, faceplate and boring mill jaws, and so on. Copy of Catalog No. 61 free to mechanical executives upon request.



STANDARD
Dial Bore Gages

"CONVOY
YOUR PARTS
THRU
PRODUCTION"

STANDARD GAGE CO. INC.
POUGHKEEPSIE, NEW YORK

A Lesson in CYLINDRICAL GRINDING

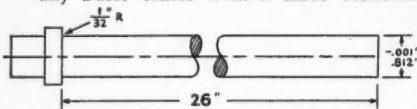
Equipment

Norton 6" x 30" or 10" x 36" Type C Plain Cylindrical Grinder, 24" x 3" x 12" 50-L5BE Alundum wheel for rough grinding and 3880-J5BE Alundum wheel for finish grinding, three steadyrests, 1" micrometer.

Operation No. 1

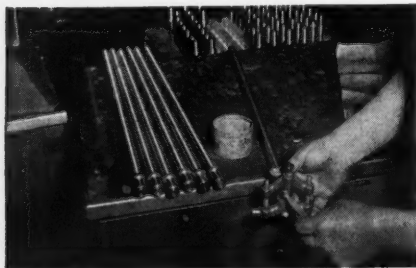
Mount the work in the grinding machine.

1. Wipe the center holes clean. Remove any burrs either with a three cornered



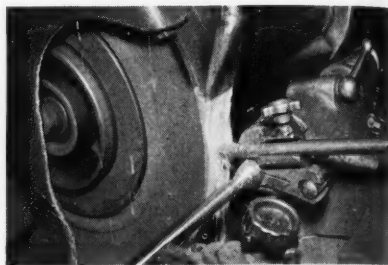
scraper or on a center hole lapping machine.

2. Inspect the work centers; regrind them if scored.
3. Position the headstock and footstock on the table so that the work comes approximately over the center of the table.
4. Clamp a driving dog on the shoulder end of the piece and lubricate the center holes with red or white lead, mixed with oil.
5. Mount the work between centers and adjust the driving pin in the face plate so that it strikes the dog squarely. Adjust the footstock so that the work turns with a snug-running fit.



Lubricate center holes in work

How to grind a relatively long and slender annealed steel shaft straight and round to a high grade finish and up to a shoulder at one end.



Use full flow of coolant when truing wheel

Operation No. 2

Dress the 50-L5BE Alundum wheel coarse for fast cutting.

1. Position the diamond tool in the holder so that it has a minimum amount of overhang and the nib is at an angle to the grinding wheel face in the direction of wheel rotation. Clamp the diamond tool firmly. A loose diamond or diamond tool will cause chatter marks on the work surface.
2. Turn on the coolant and feed the wheel into the diamond about .001" per pass. Use a medium table traverse. Take only enough passes to dress the wheel coarse. Excessive dressing wastes both wheel and diamond.

Operation No. 3

Rough grinding the .812" diameter to .814".

1. Space the three steadyrests equally along the work. Judgment and experience rather than any fixed rule govern the number of steadyrests to use for a given part. Do not immediately adjust the steadyrests.

Measure the work to determine how much stock has been left for grinding.

Advance the wheel to the work at the footstock end until sparks are just seen. Set index against stop. Then measure the work. Similarly, advance the wheel to the work at the headstock end to the same index setting. Measure the work at this end. If the diameters are not exactly the same, swivel the table a proportionate amount in the right direction so that the work will be ground straight.

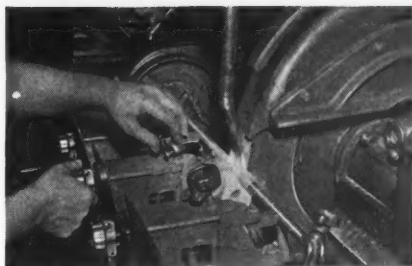
Spot grind the work opposite one of the steadyrests until a steady and uniform stream of sparks indicates the work is running true. Then bring the lower shoe of the steadyrest firmly against the work. With the other hand adjust the front shoe so that it rests lightly but snugly against the work.

Similarly, spot grind opposite the other two steadyrests, adjusting the shoes as just described.

Plunge cut grind the .812" diameter next to the shoulder to within .002" or .003" of the rough grind size. "Bump" the shoulder with the side of the wheel to just clean.

Set the table dogs so that the table reverses within $\frac{3}{4}$ " of the shoulder and overlaps the footstock end of the work about $\frac{1}{3}$ of the wheel face.

Rough grind the .812" diameter to .814". Use the fastest work speed, a fast table traverse and a wheel feed of no more than .0005" per pass to avoid springing the work. Use plenty of coolant. This is important. Carefully adjust each steadyrest as the work passes it. Be careful not to take up too much on the front shoe of the middle steadyrest as this would force the work toward the wheel, causing the work to be ground smaller at that point. Too much pressure on the bottom shoe will raise the center of the work, with the result it will be ground oversize.



Adjust steadyrests carefully

Release the steadyrest shoes before mounting each piece but do not disturb their setting after rough grinding the last piece and checking it to be sure it is straight within .002".

- Redress the grinding wheel coarse as necessary, possibly every four to six pieces, to insure perfectly round work. A dull wheel will cause the work to come out of round.

Operation No. 4

After rough grinding the entire lot of pieces, finish grind the .812" diameter to blueprint limits.

- Remove the 50-L5BE Alundum roughing wheel and replace it with the 3880-J5BE Alundum finishing wheel. Dress the wheel fine, using the slowest table traverse and reducing the cut from .001" to none whatsoever on the last pass or two.
- With a very light wheel feed, not exceeding .0003" per pass, and a medium table traverse, take a sufficient number of passes to bring the work down to finished size. Do not disturb the steadyrests during this finish grinding operation, provided the pieces are being ground straight and round. Check the work for size at each end and between the steadyrests.

W-878

NORTON

NORTON COMPANY
Worcester, Mass.

Please send a copy of your new booklet
"The A B C of O. D. Grinding . . Cylindrical
—Centerless."

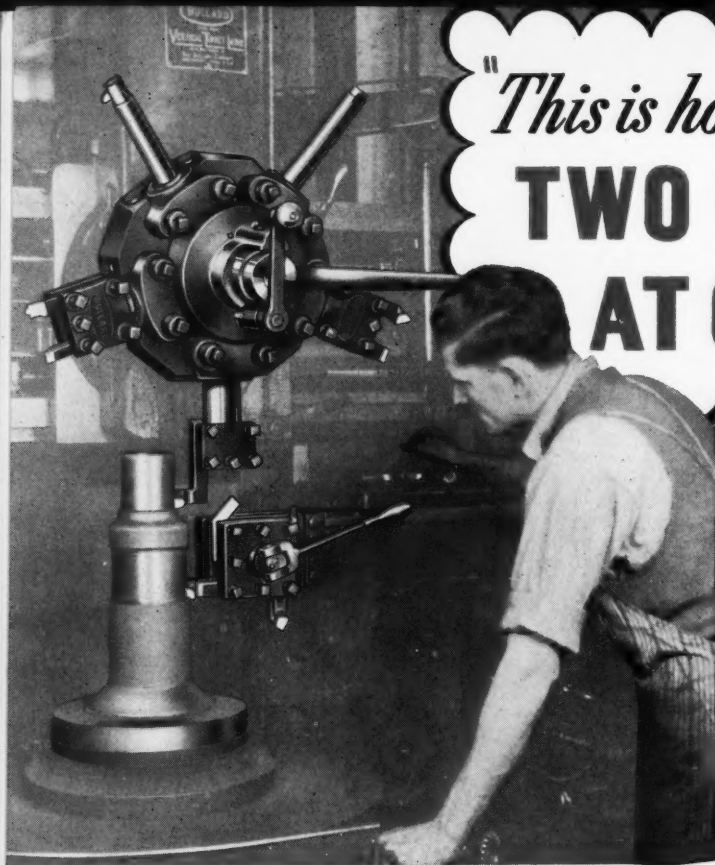
Name

Title

Firm

City State

Plunge cut grinding at shoulder



"This is how I make
TWO CUTS
AT ONCE

★ Any experienced operator will tell you he cuts time on cuts and between cuts with his Bullard Vertical Turret Lathe because he has two independent heads that he can use simultaneously.

Take a job like this one. There are nine different operations—but the job only has to be chucked once — and standard lathe tools do the entire job. No wonder they call the V.T.L. the most versatile machine in the shop.

BULLARD load fast
VERTICAL cut fast
TURRET save time
LATHES between cuts
are accurate

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July, 1

Modern Equipment at Work

Rotary Press Table Aids Lockheed Production

Merry-Go-Round on the production line at the Lockheed Aircraft Corporation plant in Burbank, Calif., is this 250-ton single-action hydro-press with a rotary table that can handle more than 20,000 parts in eight hours with only a handful of men. The rotary table was designed by Lockheed equipment designers. After each "feeder" has placed one or more small parts on the die as it wheels past him, the rotary table is turned one notch until eventually all dies and the parts they are to form are pressed under the heavy roof of the hydro-press. Up to recently all hydro-press forming was done on two huge presses of 2500 and 4500 ton capacity, and requiring some 20 men to handle about 12,000 parts in eight hours. The

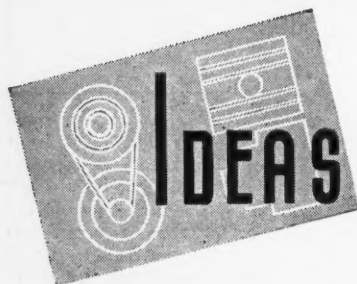
machine shown here costs only about one-third that of the bigger press and turns out nearly twice as much work with less than half the manpower. This effects a great savings in time and expense in the fabrication of small parts for the famous Lockheed "Lightning" P-38 for the U. S. Army Air Force and Hudson bombers for the British Royal Air Force.

"Data on Production Facilities" is the title of an interesting and informative catalog now being issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio. The catalog includes a complete list of machines that comprises the Kirk & Blum facilities for prompt execution of sheet metal, sheet steel, and light plate fabrication. The name and size of each piece of equipment is listed. In addition, throughout the catalog are many illustrations of

various sheet metal parts and large assemblies which have been fabricated under contract for many leading national industries. Copy free upon request.



Operators at Lockheed Aircraft Plant Produce More Than 20,000 Parts in Eight Hours with this Single - Action Hydro-Press Equipped with a Rotary Table



IDEAS FROM READERS

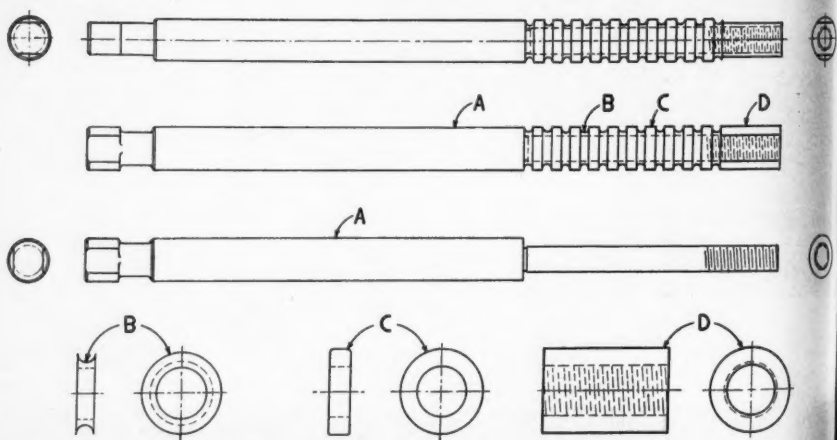
Sizing Tool With Replaceable Elements

By A. W. VAN EVERA
Canada

HERE is a drawing and description of a sizing or burnishing tool, the design of which includes some unusual features. The tool is made entirely of machinery steel, case hardened, and was designed to take the place of a solid high speed steel tool previously used for the sizing operation. The idea was offered to the firm, who purchased it from the writer and suggested that it might be useful to readers of MODERN MACHINE SHOP.

No sizes are given on the drawing, as the prospective user will need to make it fit his own work. The main body of the tool **A**, however, is about 0.010 inch smaller than the first sizing ring. The rings step up progressively in size, each ring being 0.0005 inch larger in diameter than the preceding one. The first sizing ring should be about 0.003 inch under size, the seventh to size, and the last three 0.0003 inch larger than the desired size of the hole.

The locking nut **D** at the end of the tool is made about 0.015 inch smaller than the sizing rings, which will allow it to drop through the hole when the operation is completed. A

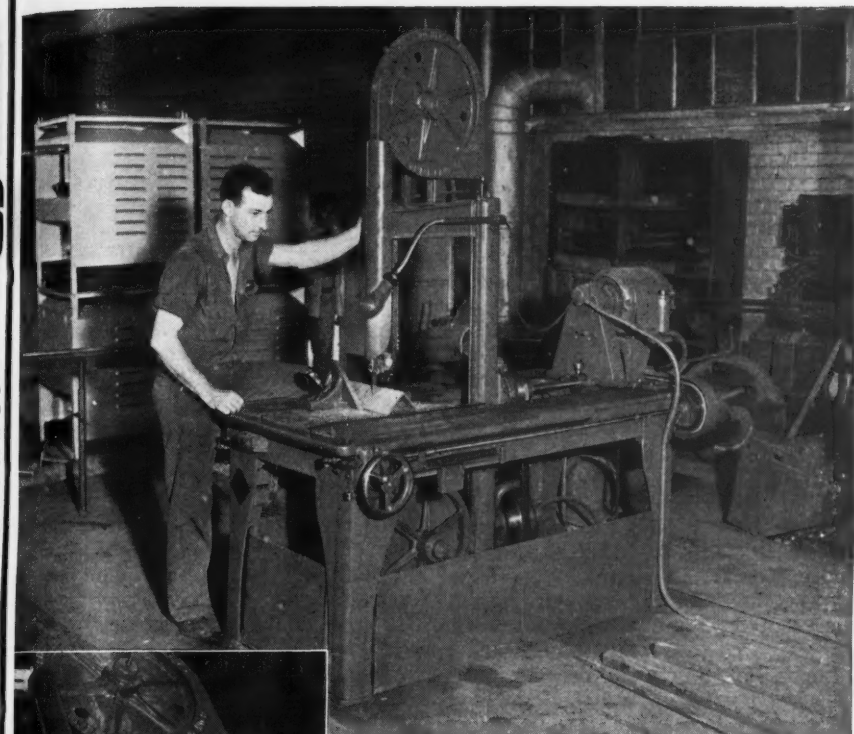


Drawing of Burnishing and Sizing Tool with Replaceable Sizing Rings

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Mitering a structural angle iron—with a MARVEL No. 8. The blade is fed into the work. Work is held stationary on the bed in quick action vise.

Shipbuilding calls for Universal tools

There's a lot of sawing — cutting-off, mitering, notching and special cuts wherever ships are being built, and work comes in all sizes, too. That's why you'll find MARVEL No. 8 Metal Cutting Band Saws in shipyards and Navy yards, as well as in tool rooms and die shops.

The MARVEL No. 8 is the most universal sawing machine built. It will snip off $\frac{1}{8}$ " drill rod or cut off an 18" x 18" structural shape with equal efficiency, or will save hours of machining by roughing work to size and shape. It will cut at any angle from 45° right to 45° left, has a large "T"-slotted table (for holding irregular shapes, special fixtures, etc.) and both power and hand feeds. It is a busy machine wherever found, for it does so many different jobs and does each one well.

ARMSTRONG-BLUM MFG. CO. "The Hack Saw People"
3700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N. Y.

fine thread—24 Pitch—is used on the locking nut.

When worn as much as 0.0003 inch, the sizing rings are too much under-size to be of use, consequently if the tool is solid, it becomes scrap. By using replaceable sizing rings, the rings can quickly be replaced with new ones, thus saving on time, material, and labor. In hardening, the rings are left in cyanide for 15 minutes, which gives them a hardness of 99 with a Shore Scleroscope. Flats are ground on the nut parallel with the flats on the draw end of the tool, so that the operator can see how much adjustment is necessary, if any, so that the T-slot can be used to lock the tool.

The tool is used on "oilite" bearings and up to the present time it has been used to burnish and size more than 3,000 bearings. The same type of tool can be used as a broaching tool by merely backing off the

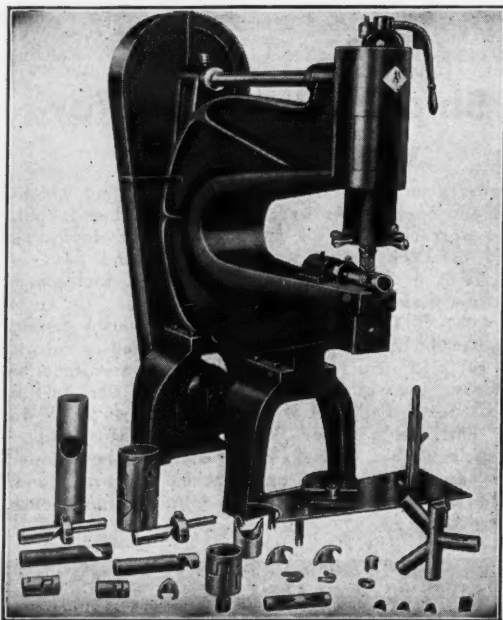
four sizing rings to produce a cutting edge on each. The tool has served with great satisfaction.

Salvage Uses for Worn-Out Taps

By EDWARD E. FELTER

IN these days when tools are at a premium we are glad to pass on a practical idea for making use of worn-out taps. First, if the tap is dulled or stripped to a point that makes further use impossible, if the body is whole the tap can be converted into a reamer or plug gage. Simply grind off the threads, being careful not to burn the tap, then finish by grinding to the desired size in a cylindrical grinder.

If the tool is to be made into a reamer, it will be necessary to back off the blades in a cutter grinder.



For **FAST** and **SAFE** cutting of sheet metal, duplicating parts, and to relieve other machine tools, investigate the

SAVAGE NIBBLING MACHINE

TUBE SLOTTING AND TUBE SHAPING
For cutting flat sheets by template or to a scribed line.

Cutting Capacities

Flat Sheets Mild Steel $\frac{3}{4}$ "
Tough Alloys $\frac{3}{8}$ "

Tubing

Wall thickness to $\frac{1}{8}$ "
1" I.D. to 36" O.D.

Throat Depth

12" to 36"

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Showing Tube Cutting Attachments
and Samples of Work

Manufactured by

W. J. SAVAGE COMPANY

Since 1885

KNOXVILLE TENNESSEE
Pioneer Manufacturers of Nibbling Machines

BROACHING ADVANCES CONTINUOUSLY

BROACHING, which has taken its place among machining methods as a process of great resource, is making continuous advances under the lash of war demand.

New methods of using broaching—new problems solved by it—greater speed—more economy—advances along these lines are of almost daily occurrence.

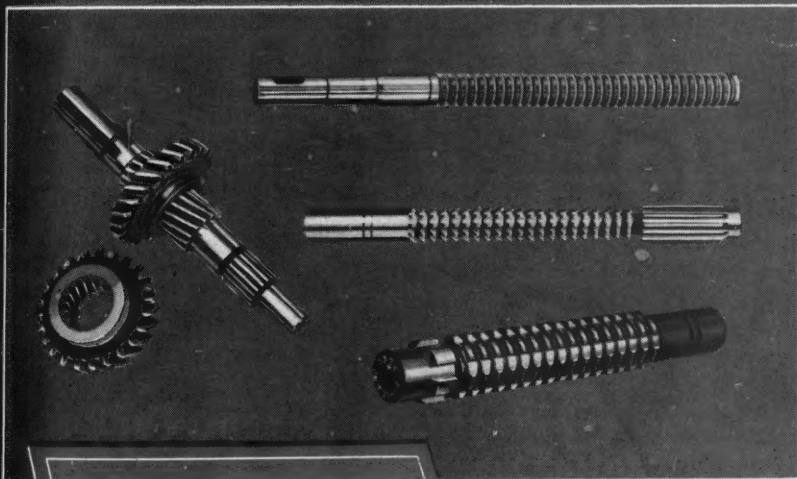
The Red Ring Double Jump Broach opens an entirely

new field of operation, making notable savings in time and tool cost. Red Ring Broaching of multiple involute splines for universal joints and other machine elements permits high strength-weight ratio, and operation with minimum back-lash.

Naloy steel and improved design have provided broaches of amazing ability to stand long runs with a minimum number of regrindings.

When you consider machining methods, consider broaching—and—get the latest information on broaching.

National Broach and Machine Company has pioneered much of the high production broaching. We have accumulated engineering experience that will be valuable to you. We'll be glad to consult.



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AND MACHINE CO.**
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**SPECIALISTS ON SPUR AND HELICAL
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**ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS**

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Over and Over**



DE-STACO ARBOR SPACERS

Measured by the number of times De-Sta-Co Spacers can be used, they are the lowest in cost of any spacers you can buy.

Made of metal, they are not affected by oil or heat.

Use for quick set-up of milling machine cutters and wherever low cost, accurate spacing is needed. Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

TRIAL ASSORTMENT—enough for average use on one machine sent for \$1.00. Give arbor size.

Size and price list sent **FREE!**

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Established Over 25 Years
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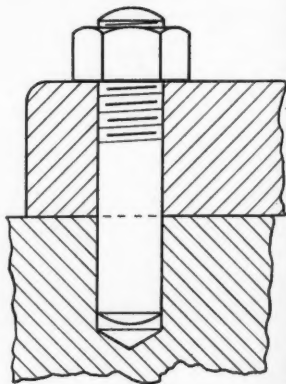
In some cases the cutting action can be improved by dishing out the flutes. In this manner a worn-out tap can be used to make a reamer for odd-size holes and thus save the cost of a special reamer.

If the tool is to be made into a plug gage, the four lands usually found on a tap will serve very well for sizing and checking out-of-round holes by simply rotating the gage in the hole. After the tool has been ground to the desired size, however, the burrs on the flutes should be stoned off. Even if the tap has been broken off short—too short for further use as a tap—it can usually be converted to use as a plug gage. If the tap is too short, one end can be ground undersize and a piece of tubing can be pressed on for a handle.

Good Dowel Design

By R. RICHARDS
England

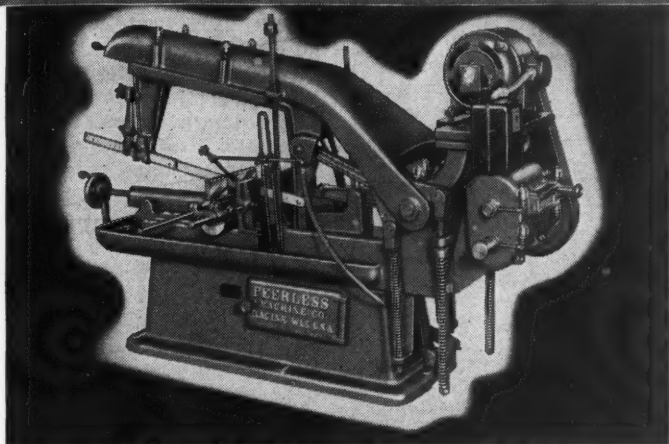
WHEN heavy machine parts are to be doweled together, it is usually taken for granted that the time may come when it will be necessary



Drawing of Self-Pulling Dowel

to disassemble the parts one from the other. If the parts are massive, it

THE ALL-AROUND SAW FOR FAST, ECONOMICAL METAL CUTTING



REDUCE WASTE SAVE CUTTING TIME AND MATERIALS WITH PEERLESS STANDARD POWER SAWS

You'll quickly find dozens of ways to speed up metal cutting, reduce waste and save vital materials with this versatile Peerless Standard Power Saw . . . in your tool making departments, steel storage, welding departments, bridge shops . . . wherever metal is cut.

The thin, cool-cutting blade cannot fracture or surface harden the face of the metal . . . it saves precious materials by its fine accuracy — as little as $\frac{1}{16}$ " of the material is removed from the cut. Table design permits feeding work from the front or either side. Large, odd-shaped pieces quickly lock into place. Vise jaws swivel for 45° angle cutting.

Send us samples of your toughest materials. We'll saw them and tell you how.

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METAL SAWING MACHINES

PEERLESS MACHINE COMPANY, Racine, Wisconsin

- ☐ Mail catalog on Peerless Standard Power Saws.
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Individual.....

Street.....

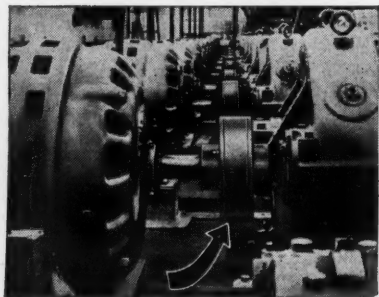
City..... State..... MM 7-42

FAST, ACCURATE CUTTING DEMANDS POSITIVE BLADE CONTROL

Shutdowns Reduce Output -Here's A Way To Avoid Them

The loss you would suffer in output by being forced to shut down a Productive Machine for repairs would probably be greater today than at any time in your history—why not guard against such shutdowns by using KANTI-LEVER COUPLINGS? They have a Cushion Torque that protects your Productive Machines, your Gears, Motors, Speed Reducers, Bearings, etc. by absorbing the constant vibration and sudden load shocks that cause gradual deterioration and finally shutdowns and rush repairs. They likewise protect you against the evils of shaft misalignment the same as does the ordinary Flexible Coupling. The cut below shows 70 KANTI-LEVERS that have run for 18 years and during that time have paid back their first cost many times over by reduction of repair bills and prevention of shutdowns.

Send for Bulletin 28-M describing
KANTI - LEVER COUPLINGS



BROWN
ENGINEERING CO. 120 N. THIRD ST.
READING, PA.

may be easier to slide the parts apart than to lift or pull them apart. In such a case the task is simplified if the dowel can be removed first, but the usual or ordinary type of dowel is not easily removed.

The dowel illustrated in the drawing is designed so that it can easily be withdrawn when necessary. Added to the usual length of the dowel is an extra portion which is threaded to receive a nut after the parts have been assembled and doweled. The nut is not drawn tight enough to disturb the tight fit of the dowel. When dismantling becomes necessary, the nut is threaded down on the dowel, loosening it so that it can easily be removed or pulling it out far enough so that U-washers can be slipped under the nut and the pulling process repeated.

A Good Sizing Tool

By W. E. HOLBROOK

OCCASIONALLY the machining operations on a small batch of work will include a sizing operation on the bores. The job may not be big enough to justify the cost of a special or standard reamer, or the time may be too short to permit ordering such a tool. In such an emergency the tool shown in the illustration will provide a quick and cheap answer to the problem.

Using good tool steel, a disc is made and the two faces are recessed in the manner indicated. The disc is turned to such a size that its diameter will be slightly greater than the diameter to which the bores are to be finished. Then two notches are cut in the periphery at points diametrically opposed, as shown, and each half of the periphery is backed off, the backing off providing clearance while the recessing on the faces provides the necessary cutting rake.

MAGNETIC CHUCKS

Also Mfr's of
Demagnetizers
Lathe Chucks
Milling Machine Vises
Power Hack Saws
Dividing Heads



WATERPROOF
for
Wet or Dry Grinding

Guaranteed to provide highest magnetic holding power on 110 or 220 Volts D. C. Scientifically designed and made of the highest grade materials. Made in 4 sizes,

5 3/4" x 13" Size...\$47.65 8" x 24" Size...\$109.30
6 1/2" x 18" Size...\$63.15 10 3/4" x 37" Size...\$202.05

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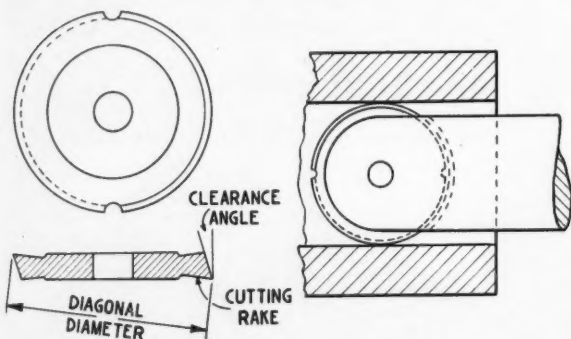
L-W CHUCK CO.

20 N. ST. CLAIR ST.

TOLEDO, OHIO

The cutter is hardened and ground on the periphery until its diagonal diameter is equal to the finish dimen-

shows signs of wear in one spot, it is rotated slightly to bring a new section of the cutting edge into action.



Design of a Cheap, But Efficient, Sizing Tool

sion of the bores, after which it is mounted on a bar, either by bolting to a flat milled on the side of the bar at the end or in a slot milled in the end of the bar. This tool will do an excellent job of sizing. When it

were faced with the problem of holding small nuts in a position that was impossible to reach with the fingers and for which no standard wrench was suitable. To eliminate the difficulty we designed the nut holder

Handy Nut Holder

By C. F. Fitz

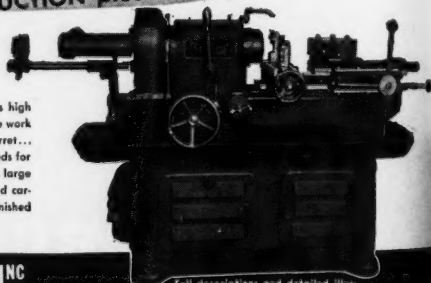
IN assembling small parts on a production basis, many opportunities are afforded to expedite the work by the use of special tools. Such a tool is illustrated in the drawing.

In assembling mechanical units we

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret—Infinite Spindle Speeds

Features HIGH SPEED PRODUCTION plus OPERATING ECONOMY

The MOREY 2G Timken Bearing Turret Lathe insures today's high speed production with a minimum of operating expense. More work at less cost with these money saving features: Self-Locking Turret... Vibrationless precision with an infinite variety of spindle speeds for every job... Back Gears instantly thrown in through extra large Twin Disc Clutch... takes full advantage of high speed and carbide tools. Modern design for modern production. Can be furnished with tooling.



MOREY MACHINERY CO., INC

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Full descriptions and detailed illustrations are shown in Circular 529. Ask for it TODAY!

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Tap Reconditioner



1. CHAMFERS
R. & L. H. TAPS
2. SPIRAL
POINTS
3. POLISHES
SPIRAL
POINTS

The new Detroit Tap Reconditioner has been developed to meet the need for conservation of tools under the War Production Program by decreasing tap consumption, decreasing tapping costs through increasing the output per tap during its useful life and providing an efficient low-cost method of accurately reconditioning taps.

Bulletin TR-1, describing the Detroit Tap Reconditioner is available on request.

See for your handy Wall Chart—"Recommended Angles for Reconditioning Taps"

THREAD GAGES
RING & PLUG

TAPS
SPECIAL & STANDARD

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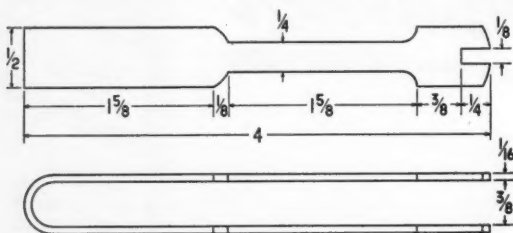
8432 BUTLER
DETROIT

shown in the illustration.

The tool consists of a single piece of spring stock, $\frac{1}{8}$ inch thick and approximately $8\frac{3}{4}$ inches long, form-

the ends of the holder and the ends are compressed to hold the nut, then it is positioned where needed and the screw is threaded through the nut.

The holders have worked out so well that we have made a number of different shapes and sizes for various jobs.



Nut Holder for Assembling Nuts in Difficult Places

ed to bring the two ends even and so that a space from $\frac{3}{8}$ inch to $\frac{1}{2}$ inch would be provided between the ends for gripping the nut. Slots in the ends provide for the insertion of the screw. Any or all of the dimensions will, of course, be changed to suit the user's conditions.

To use, the nut is placed between

ONE of our machinists found it necessary to grind the side of a square block of steel, for which he used a disc grinder that was equipped with glass safety guards across the top, as shown in Fig. 1. In the course of this operation the machinist found it necessary to assume a position in which his eyes would be

Using His Head Saved His Eye

By ROBERT A. SHAW



MOTORS



A complete line of Ball Bearing equipped Squirrel Cage type Industrial motors, built to NEMA specifications in sizes from $\frac{1}{2}$ to 75 H. P.

The Lima Type RS Motor shown at left is designed to afford maximum protection in locations where splashing or dripping liquids, chips or filings, etc., are present. Reduce maintenance and operating costs with Lima Electric Motors.

Write today for additional data.
PROMPT DELIVERIES

THE LIMA ELECTRIC MOTOR COMPANY, LIMA, OHIO
 Offices - New York - Detroit - Chicago

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The last word...

in wet seat
grinding for
Aircraft Radial Motors

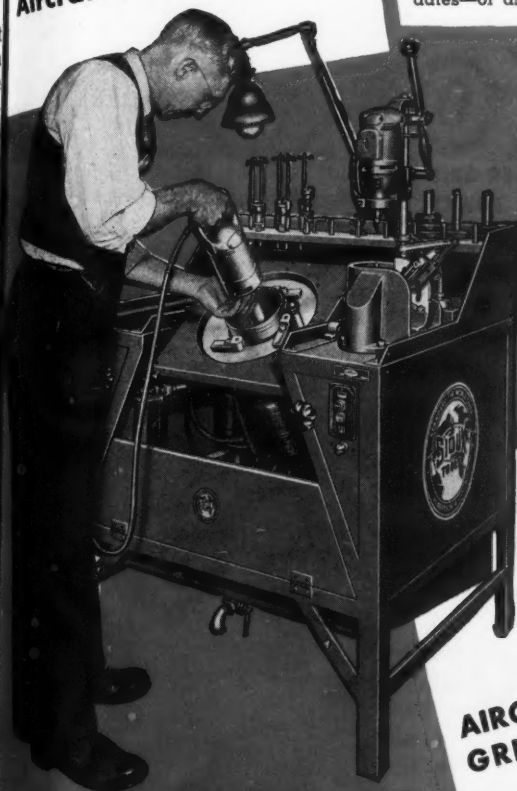
This new SIOUX development assures better finish and accuracy . . . eliminates wheel loading and scratching . . . reduces wheel dressing to a minimum. For compactness and efficiency, it is the *last word*.

The cylinder is held securely in an ingenious worktable which turns and rotates for wet grinding both exhaust and intake valve seats without removing cylinder. **Wide Range**—up to 6 7/8" skirt diameter.

The coolant, being fed from the bottom upward between cutting wheel and valve seat, flushes away all grindings. Coolant pump motor has independent button switch and safety light.

This machine has so many time-saving conveniences, you will want complete details.

Write or wire for complete details and delivery dates—or ask your SIOUX Distributor.



SIOUX

AIRCRAFT WET VALVE SEAT
GRINDING MACHINE

STANDARD THE

ALBERTSON & CO., INC.



WORLD OVER

SIOUX CITY, IOWA, U. S. A.

, 1942

July, 1942

MODERN MACHINE SHOP 197

You'll Agree!

"...THE BEST ALL AROUND
OFF-HAND GRINDER OUR
TOOL-MAKERS EVER USED"



- HANDIER GRIP
- MORE POWER
- 50,000 R. P. M.

KIPP *air* GRINDER

Madison-Kipp tool-makers originated the first really high speed grinder. They know a great deal about the practical side of grinder design and grinder usage. They think the new Model H is the best all around off-hand tool they have ever tried and we are sure you will agree with them. If you are doing priority work...

Order Today \$29⁷⁵

Please attach preference rating certificate with order.

MADISON-KIPP CORP.

208 WAUBESA STREET
MADISON, WIS., U. S. A.

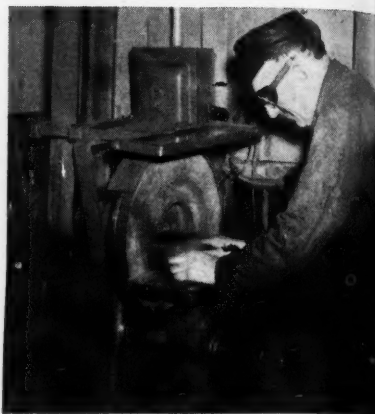


Fig. 1—Finding it difficult to grind in this position and look through the glass guard at the same time, this operator had an excuse to take a chance.

outside of the safety zone of the glass. Although faced with an excuse to take a chance, his good safety training prevailed and he put on his goggles, which, incidentally, have the standard 50 mm. hardened and annealed $\frac{1}{8}$ lens.

To the machinist's surprise, a small part of the grinder disengaged itself

Fig. 2—This picture shows what would have happened to his eye if the machinist had not followed the safety rules and put on his goggles.



1/39 the thickness of a dollar bill



YOU CAN GRIND THAT ACCURATELY
WITH A DUMORE



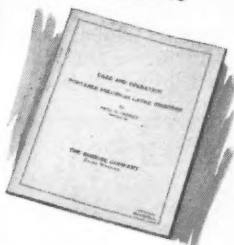
Unusual applications of Dumore Precision Grinders are daily occurrences in tool rooms and machine shops. Here, for instance, a Dumore No. 77 with external quill is grinding down a heavy duty clutch face. Flexibility, plus delicately controlled accuracy . . . to .0001" . . . is responsible for surprising savings in labor costs . . . elimination of delays and reduction of spoilage on grinding jobs, internal and external. Mount Dumore Grinders on lathes, shapers, milling machines, or other machine tools . . . modernize your old machinery . . . increase the efficiency of your new equipment. Whether your grinding problem is a delicate finishing operation or heavy hogging work, there

is a Dumore Precision Grinder to fit your needs. Get all the facts at once. Call the Dumore Industrial Distributor in your city or write, today.



THE DUMORE COMPANY, Dept. 182-G, Racine, Wis.

WRITE FOR THIS
HELPFUL INSTRUCTION
BOOK ON PRECISION
GRINDING



Care in operation of equipment is a vital war-time necessity. For this reason, the Dumore Company now offers **FREE OF CHARGE** this practical hand book which regularly sells at 25 cents. Write for your personal copy today.

Dumore PRECISION Grinders

and flew out, striking one of the lenses in the goggles. Here is an actual case where a little bit of extra precaution saved a man's eye—and it surely was worth it. The broken lens can be seen in Fig. 2.

College Machine Shop Converted to War Factory

PURDUE UNIVERSITY'S student machine shops at Lafayette, Ind., customarily used only for routine practice work, recently have been converted into a war production factory under terms of a Westinghouse subcontract, according to R. A. McCarty, vice president in charge of the company's subcontracting program.

More than 275 engineering students enrolled in the shop course are working part-time on the subcontract. Together their production is the equivalent of a 75-man machine shop working full time on war materials.

Purdue's president, Edward C. Elliott, announced that the University machine shops had been set up on a

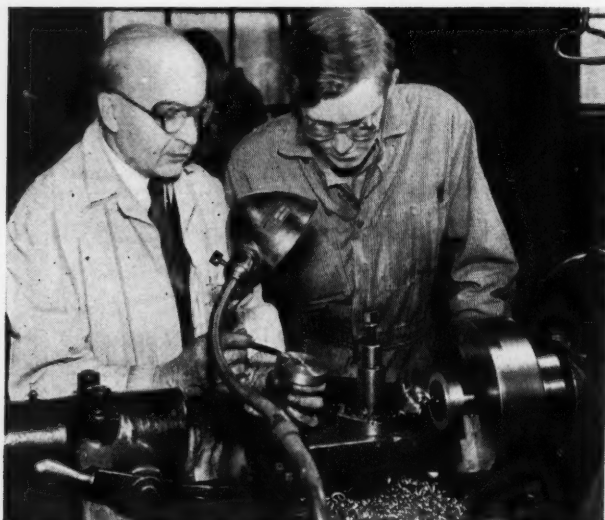
"strictly production basis," with students temporarily becoming workmen during the portion of each day they are in the shop, and instructors becoming shop foremen.

Special stock material required for some parts being made by Purdue students has been supplied by Westinghouse. For the purchase of other materials the university has received a priority rating from the War Production Board.

The Importance of Trifles

WHEN the War Production Board issued its order which will end the use of iron and steel in more than 40 familiar civilian products, the list of those products formed an interesting catalog of the things we use. Mostly they are smaller items—the smallest probably are phonograph needles—but in the aggregate they will save tremendous quantities of the material most needed to win the war.

In total war there are no trifles. An interesting proof of this is found in the fact



C. A. Haag, a veteran instructor in the Purdue University machine shop at Lafayette, Ind., inspects the work of William L. Rose, a sophomore electrical engineering student from Rensselaer, Ind. Rose is one of 275 Purdue students who are producing war materials in the machine shop, once used only for routine practice work. The shop has been converted into a war production factory under the terms of a subcontract placed with the University by the Westinghouse Electric and Manufacturing Company.

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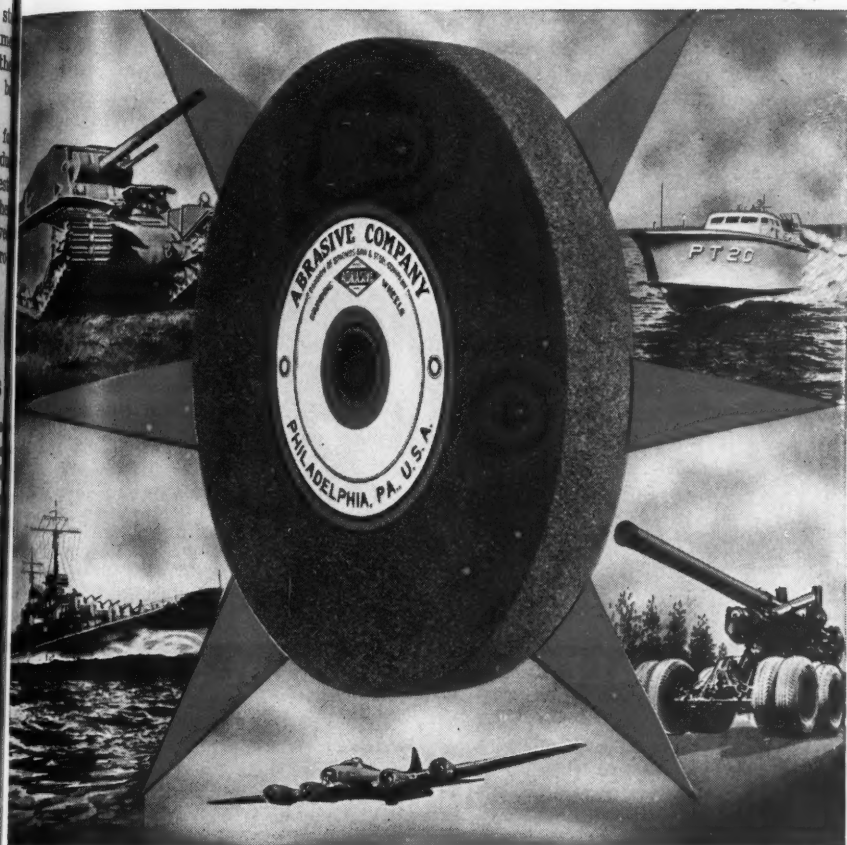
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July, 1942



Production speeds Victory! Speed production with

ABRASIVE COMPANY GRINDING WHEELS



1892 FIFTY YEARS OF SERVICE TO INDUSTRY 1942

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DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES

MODERN MACHINE SHOP 201

that by eliminating the manufacture of blackhead squeezers we shall save 110,000 pounds of steel. Instead of beauty aids, this steel will be used to make four 155 mm. field pieces, or a thousand 3-inch trench mortars, or 4,400 .30 caliber machine guns, or fifty-five 16-inch shells, or one hundred ten 200-pound aerial bombs. Or we can make three 15-ton tanks, and have something left over to arm them.

Because we are not going to be making manicure scissors for the duration, we shall save approximately 630,000 pounds of iron and steel—the equivalent of 19,687 four-inch shells or one hundred sixty-two .37 mm. anti-aircraft guns. And those 162 anti-aircraft guns may be the means of insuring that we may have manicure scissors in the future instead of having to go without them permanently.

We are saving 440,000 pounds of steel because we won't be making any more nail clippers—and that steel will provide material for twenty-four 4-ton army

trucks or 8,800 100-pound aerial bombs to be dropped on Tokyo. The 300,000 pounds of steel that last year were used to make cuticle pushers will be used this year to make 3,000 .50-caliber machine guns, or the equivalent.

One of the most important savings made in this group is the 16,000,000 pounds of steel which will be saved because it will not be made into hair pins and bobby pins. But American women can reconcile themselves to sketchy hairdos with the thought that their bobby pins will now supply materials for 160,000 more .50 caliber machine guns to help maintain the freedom of our United States. And without that freedom there will be no bobby pins from now on.

"Safety Simply a Matter of Horse Sense" is the title of a four-page folder released by A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn, N. Y., describing various Schrader pneumatic safety equipment, its installation, and operation. Copy free upon request.

CERRO ALLOYS for Prompt Shipment



CERROMATRIX (Melting Temp., 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, for engraving machine models, stripper plates, chucks, short run forming dies and other metal working applications.

CERROBEND (Melting Temp., 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

These two low-temperature-melting and expanding alloys are helping to speed up production of war materials for the Army, Navy and Air Force.

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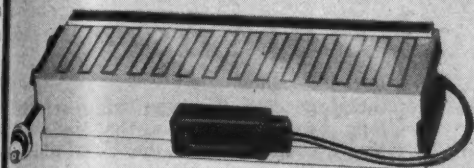
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SIZE No. 618

**This Type Available in Sizes
Up To 30 x 96**



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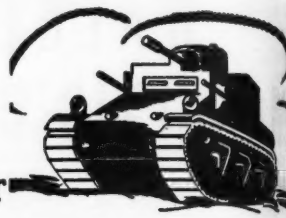
Walker presents a complete line of Magnetic Chucks for modern equipment . . . Rectangular, Swiveling and Rotary Types in all sizes.

**"The Best Way to Hold Most Work—
The Only Way to Hold Some Work."**

Also belt or motor-driven DC and portable AC Demagnetizers.

Write for Catalog W4.

O. S. WALKER CO., INC.
WORCESTER, MASS. • U. S. A.



Tools For National Defense

Norwood Hydromatic Lathe

A multiple tooled, fully hydraulic, automatic lathe for producing shells, to be known as the Norwood Hydromatic Lathe, is now being manufactured by The Norwood Engineering Co., 99 N. Maple St., Florence, Mass. The lathe is made in four standard models for use in performing the different operations required in producing shells from 50 to 155 millimeter.

The Model ST-1, which is designed for centering and cutting-off shells, has a carriage on which is mounted a rest having a solidly mounted motor and center drill. The Model ST-2 is for use in rough turning operations and is equipped with a heavy duty tailstock of close-grain cast iron and revolving spindle of high carbon steel with No. 5 Morse taper. In

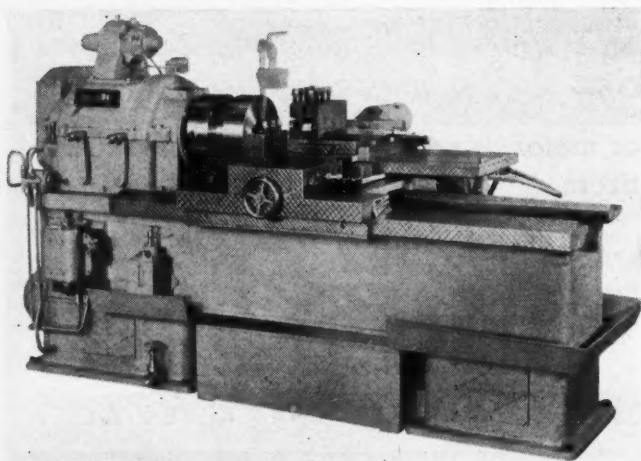
addition to a carriage with unusually long bearing on ways, the Model ST-2 has a cross slide at the front which is equipped with three toolholders for roughing tools and a unique arrangement for a boattail tool. The machine also has a back toolslide equipped with one toolholder for back facing tool.

The Model ST-3 is designed for use in boring, rough facing, rough reaming, finish reaming, and finish facing the nose of shells. Mounted on the carriage of this model is a hexagonal turret with all faces bored and tapped for mounting toolholders. The turret is designed for quick and easy manual indexing, indexing being always positive, it is claimed.

The Model ST-5 is used for cutting-off and finishing the base of shells and for cutting the band groove. The machine

has a carriage in a fixed position on which is mounted a cross slide with one toolholder and a back bracket on which is mounted a back toolslide with two toolholders.

Features of the Norwood Hydromatic Lathe include Barnes patented system of



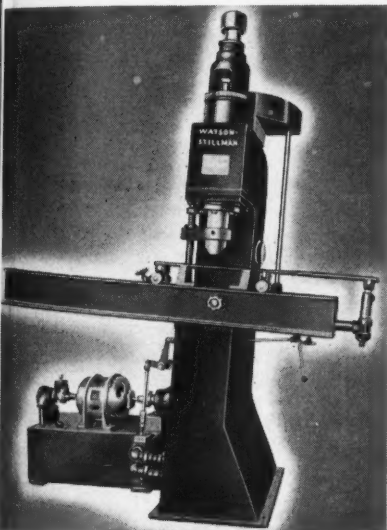
Norwood Model ST-1
Hydromatic Lathe



hydraulic transmission and control; Bijur rolling system; Link-Belt silent chain drive from motor to back gear shaft; interlocking arrangement of main drive motor with hydraulic feed mechanisms; hydraulically controlled feeds with infinite variation; rugged headstock with well planned gear arrangement; Timken radial thrust roller bearings, and extra heavy bed and pedestals. The lathe is available with 8 or 10-foot bed.

Watson-Stillman 50-Ton Finish Straightening Press

An improved 50-ton press designed for finish straightening gun barrels has been developed by The Watson-Stillman



Watson-Stillman 50-Ton Finish Straightening Press

Co., Roselle, N. J. The press is said to differ from former types in that it incorporates a positive stop adjustment controlled by a handwheel. In addition, the machine is mounted on an angle base to facilitate sighting along barrels being straightened. The press is also said to be suitable for straightening

HEAT-FAG and ACCIDENTS *Ride Together*



AVOID HEAT-FAG--USE

MORTON'S
SALT TABLETS

Beware of HEAT-FAG!

Salt lost by sweating must be replaced or workers tire quickly—accuracy and alertness are dulled. Lowered efficiency, mistakes and accidents take their toll.

MORTON'S Salt Tablets

Install Morton's Dispensers by all drinking fountains, so workers can take tablets to replace the salt lost by sweating.

ORDER NOW!

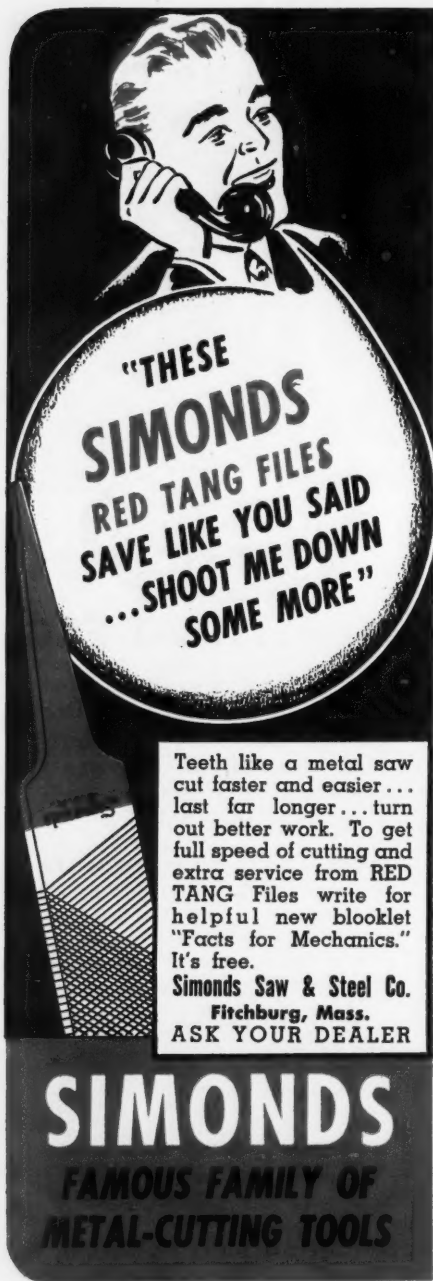
Salt Tablets,
Case of 9000 - \$2.60
Salt-Dextrose Tablets,
Case of 9000 - \$3.15

Dispensers

500-tablet size - \$3.25
1000-tablet size - \$4.00



MORTON SALT CO., Chicago, Ill.



**"THESE
SIMONDS
RED TANG FILES
SAVE LIKE YOU SAID
...SHOOT ME DOWN
SOME MORE"**

Teeth like a metal saw cut faster and easier... last far longer... turn out better work. To get full speed of cutting and extra service from RED TANG Files write for helpful new booklet "Facts for Mechanics." It's free.

**Simonds Saw & Steel Co.
Fitchburg, Mass.
ASK YOUR DEALER**

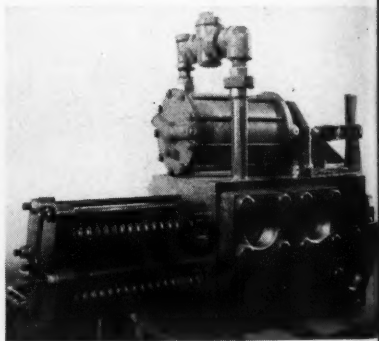
SIMONDS
FAMOUS FAMILY OF
METAL-CUTTING TOOLS

structural steel units.

The Watson-Stillman 50-Ton Final Straightening Press has a 12-inch opening, 10-inch gap, and 9-inch stroke, and is equipped with a table 6 feet long, 11½ inches wide and ram 8 inches in diameter. The machine is controlled by a single hand lever and is powered by means of a 7½ h.p. motor, operating the press through rotary vane type pumps. The complete machine weighs 7,250 lb., is 11 feet 6 inches high, and requires a floor space of 6 x 3 feet.

Southwark Four-Way Quick-Acting Operating Valve for Shell Forging Presses

Designed especially for shell forging presses, the four-way operating valve illustrated herewith is now being pro-



Southwark Four-Way Quick-Acting Operating Valve for Shell Forging Presses

duced by the Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia, Pa. The valve has a forged steel body and is provided with spindles and seats of alloy steel. Seats are removable for grinding or replacement.

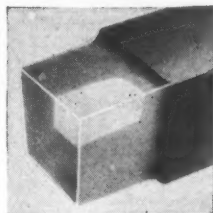
Quick-acting and efficient, the Southwark Four-Way Operating Valve is so designed to prevent loss of high pressure fluid and minimize any tendency to water hammer drawing of the seats and spindles. The valve is piloted operated and can be used with either air or hydraulic fluid controlled by an auxiliary valve.

Is Excess **DOWN** Time

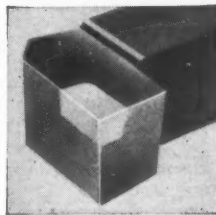
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KENNAMETAL WILL GIVE YOU LONGER Tool Life BETWEEN GRINDS

KENNAMETAL is the most durable of all steel-cutting carbide tool materials. It removes 3 to 10 times more metal between regrinds, as compared to high speed steels, and thus greatly reduces "down time" for re-sharpening and re-setting tools. The longer tool life of KENNAMETAL also enables users to operate with smaller tool inventories, reducing tool investment and increasing the nation's backlog of these vital cutting tools.



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On all types of jobs . . . on steels hardened to as high as 550 Brinell, KENNAMETAL is turning "down time" into production time . . . getting the work out faster and better.

Find out what it can do for you. Write today for the new KENNAMETAL Vest Pocket Manual.

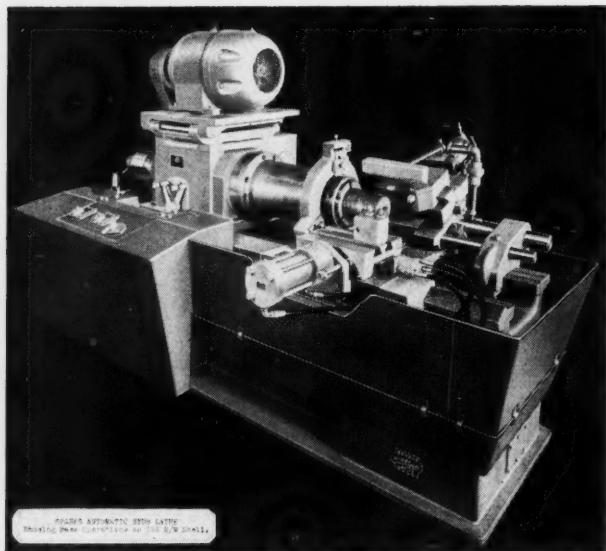
KENNAMETAL: Invented and Manufactured in U. S. A.



McKENNA METALS Co.

300 LLOYD AVE., LATROBE, PA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)



Sparks Automatic Stub Lathe Equipped for Performing Base Operations on 155 MM. Shell



tools are traversed very rapidly until contacting the work. On completion of the base operations, the tools automatically move back to the starting position, the collet in the pot chuck of the lathe opens automatically, and the shell is removed to permit the next shell to be in-

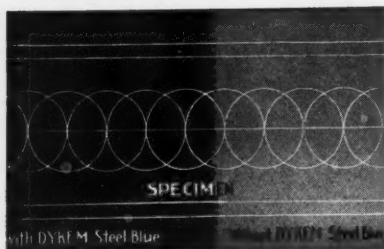
Sparks Automatic Stub Lathe

The Sparks Machine Tool Corp., Norwalk, Conn., is now producing the Sparks Automatic Stub Lathe shown here, which is designed for use in performing base and nose operations on all size shells from 75 mm. to 8 inches inclusive. The illustration shows the lathe equipped for performing base operations on a 155 mm. shell.

In performing these operations, one tool cuts off the base end of the shell and another tool forms the band groove. The movement of the tools both forward and backward is controlled through a series of sequence valves whereby the

inserted. When performing operations on all size shells under 155 mm., the shell is inserted into the spindle of the lathe.

Among the outstanding features in the design of the Sparks Automatic Stub Lathe are micrometer adjustments on the back facing tools which enable each shell to be faced off and calibrated to length and reduced to the proper weight. According to the manufacturer, the productive capacity of the lathe when operating on 155 mm. shells is approximately 26 shells per hour. The lathe is also said to be suitable for manufacturing airplane cylinders and many gun parts, including liners, breech mechanisms, and barrels.



DYKEM STEEL BLUE

Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY

2301 F. NORTH 11th ST.

ST. LOUIS, MO.

(In Canada: 444 Pacific Ave., Toronto, Ont.)

TO PLANT SUPTS.

This is one of a series of ads addressed primarily to new grinder hands. If you would like additional copies without our signature, for your bulletin board, tell us how many you need.

How to get better and longer service from your grinding wheels...

● The war imposes a double task on industry and a patriotic responsibility on grinder hands. Speed of production has to be increased, without waste of basic materials. With grinding playing such an important part in production, these simple rules may help you do your job better.

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1 USE THE RIGHT WHEEL IN THE RIGHT PLACE

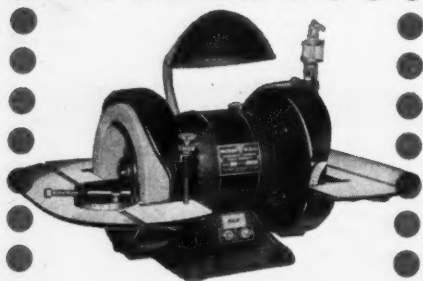
Given data on the type of grinding job, the character of metal to be ground, the amount of stock to be removed and the finish desired, a grinding wheel manufacturer can give you a wheel in the right grit, grade, grain, bond, shape and size to meet definitely your grinding conditions—a wheel that will last longer, do better work at reduced grinding costs. And sales engineering service will help you to select the right wheel for every job.

2 MAKE SURE YOUR GRINDING SET-UP IS RIGHT ON EVERY JOB

Manufacturer's recommendations should be carefully followed on wheel speed, work speed, proper coolant, wheel traverse, rate of infeed etc. Only the correct balance of these factors gives you the full advantage of properly specified wheels. One of the services performed by grinding wheel sales engineers is to check your grinding conditions on the job and point out the best method of carrying out the grinding operation.

THE CARBORUNDUM COMPANY • NIAGARA FALLS, N. Y.

(Carborundum is a registered trade mark of and indicates manufacture by The Carborundum Company.)



Prosser **CARBIDE TOOL GRINDER**

Quick Deliveries from Stock

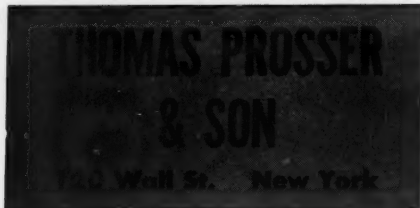
Removes metal fast when rough grinding.

Finish grinds smooth, keen cutting edges.

Oversize 7" wheels give greatly increased wheel life.

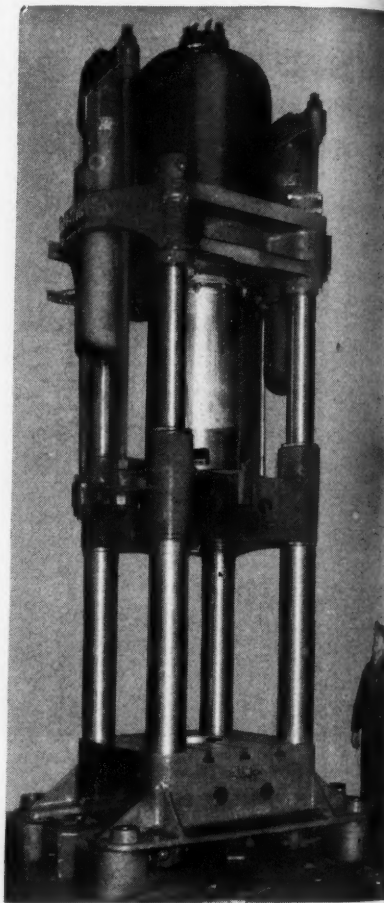
This grinder will quickly pay for itself by increased tool performance and life between grinds.

**Write for details
of this and heavy duty
Carbide Grinders.**



Southwark 500-Ton Piercing Press

The illustration shows the Southwark 500-Ton Piercing Press for use in steel forging plants which has been produced by the Baldwin Southwark Division of



Southwark 500-Ton Piercing Press

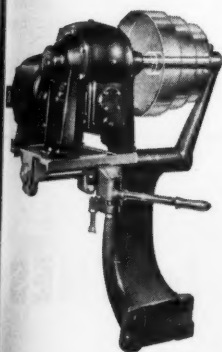
The Baldwin Locomotive Works, Philadelphia, Pa. The press has a working pressure of 1,500 lb. The main ram of the press is 32 inches in diameter and is provided with a stroke of 42 inches. The distance between platens is 36 inches, and the stripper cylinder in the

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ON YOUR NORTON CYLINDRICAL GRINDERS INSTALL **MASTERDRIVES**

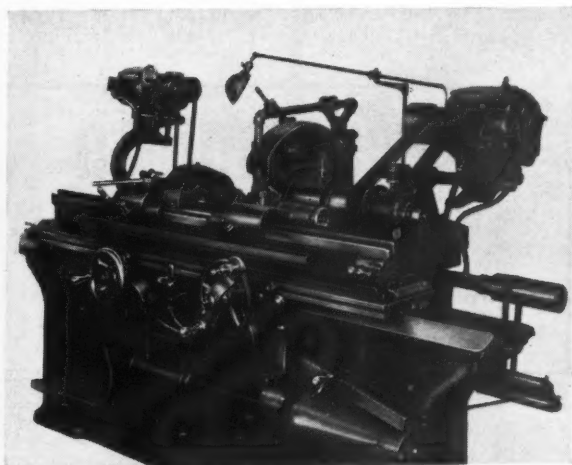
It's a quick, simple job, because MASTERDRIVES are specially engineered for the job. The famous Master Speedranger applied on work head gives infinite variation of speed through a nine to one range, permits unusual control of finish. Precision balanced motor is standard on wheel head with speed to produce unusually fine finish. Feed drive to accommodate type of feed on machine. Independent pump drive where necessary. All these drives equipped with automatic belt tensioning devices . . . The complete MASTERDRIVE line includes 550 different specifications, covers practically every machine tool drive requirement.

Each unit complete, powered by a Master gear head motor.



We'll send name of
NEAREST REPRESENTATIVE
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Masterdrive literature.

WRITE TODAY.



MASTERDRIVES applied to
Norton Cylindrical Grinder

MASTER Electric Company

INDUSTRIAL EQUIPMENT DIVISION • DAYTON, OHIO

July, 1942

MODERN MACHINE SHOP 213

bottom platen has a diameter of 12 in.

The Southwark 500-Ton Piercing Press is 25 feet 3½ inches high overall and requires a floor space of 7 feet 2 inches x 6 feet. The press is complete with operating valves and piping and is of all cast steel construction. All rams are of hard cast iron, and all cylinder guides and column guides are bronze bushed. Press columns are of special sturdy design to withstand the severe service of 240 strokes per hour on 24-hour day basis.

Photoswitch Type A28L Photoelectric Alarm Control

Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass., is now marketing the Type A28L photoelectric alarm control shown here for protection of plants, factories, and so on, against intruders and saboteurs. The control is designed for indoor and outdoor use over very long ranges.

The light source of the control projects a practically invisible light beam for distances of from 350 to 700 feet. If this

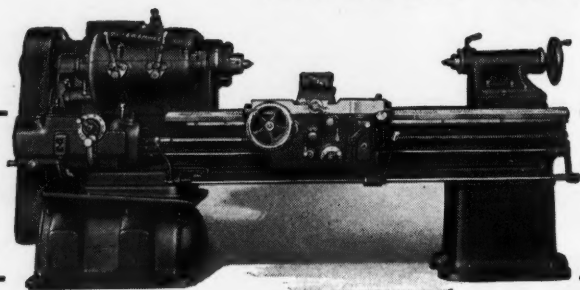


Photoswitch Type A28L Photoelectric Alarm Control

light beam is broken, the photoelectric control contacts close, thereby sounding alarms, operating a central station system, turning on flood lights, closing gates, and so on, depending upon how the control is installed.

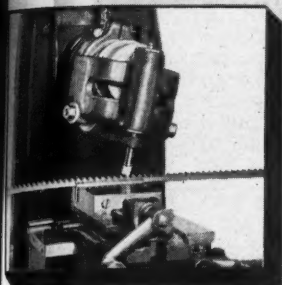
The Type A28L control is provided with a latching unit including a push-button

BOYÉ & EMMES ENGINE LATHES



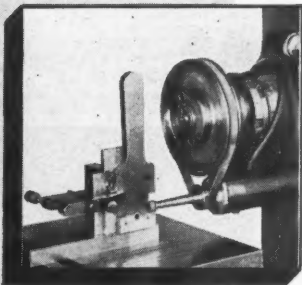
THE BOYÉ & EMMES MACHINE TOOL CO.
CINCINNATI • OHIO

LIBERTY High Speed Grinding Attachments

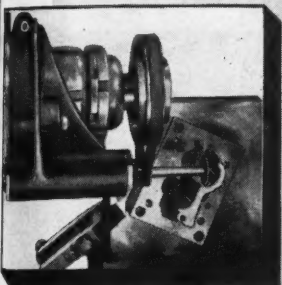


Grinding clearance of broach teeth.

Both horizontal and vertical types are easily attached to most surface grinders for grinding angles, slots, recesses and surfaces which are impossible to reach with large grinding wheels.



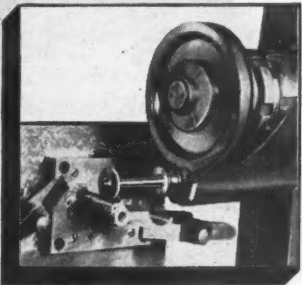
Grinding gage in perfect alignment with other points.



Grinding punch form.

For extremely accurate grinding on gages, tools, dies, etc. Assembled complete with any size bores, pulleys, belts and grinding wheels at no extra cost.

Write for details — specifying diameter of spindle head, type and make of grinder.



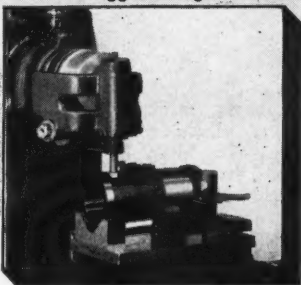
Grinding shoulder on punch.

LIBERTY TOOL & GAGE WORKS

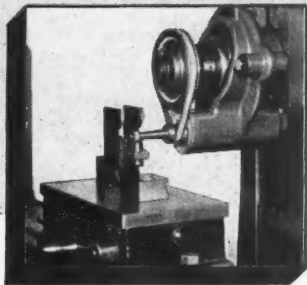
235 Georgia Ave.

Providence, R. I.

Grinding rectangular opening in trigger casing.

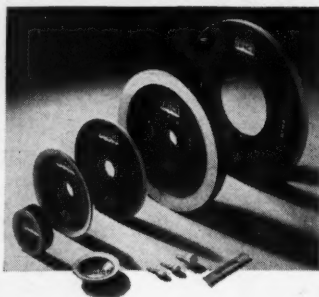


Grinding gaging seat on special gage.



DIAMOND WHEELS
RESINOID
BONDED

SECOMET



SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster, and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

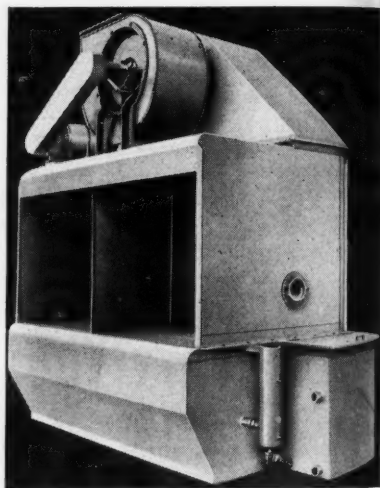
157 Chambers St.
New York
N. Y.
J. K. SMIT & SONS, Inc.

station which may be located in garage, house, office, or other convenient place. The latching unit serves to hold the alarm in operation once the light beam has been momentarily broken until a reset button is pushed.

The Photoswitch Type A28L Photoelectric Alarm Control is said to be unaffected by changes in local light and is designed for operation on 115 volts a.c. The relay contacts of the control are pure silver and are said to handle 15 ampere alternating current and 8-ampere direct current.

Industrial Improved Hydro-Whirl Magnesium Dust Collector Booth

The illustration shows the improved Hydro-Whirl Magnesium Dust Collector Booth for use in performing magnesium



Industrial Improved Hydro-Whirl Magnesium Dust Collector Booth

grinding, buffing, and polishing operations which is now being marketed by Industrial Sheet Metal Works, 630 E. Forest Ave., Detroit, Mich. According to the manufacturer, the factor of safety of this particular booth has been greatly increased over models formerly offered.

Instead of being made of steel, the

RIGHT NOW! ... these Low-Cost DRILL PRESSES

will cure your drilling headaches



No. 1370
—Floor type
17-inch "Six-Speed"
Delta drill press with
No. 2 Morse Taper
Spindle and standard
tilting table. Shown
with motor.

When you are confronted with an urgent need for a quick increase in production capacity in connection with the U. S. armament program—you should, at once, check into the possibility of utilizing the low cost Delta Drill Presses. These efficient and flexible machines are in active use in plants all over the country—as production line equipment—auxiliary machines—for special set-ups—and in hundreds of tool rooms. Their first cost, and their operating costs, are low—they are sturdy, accurate and easily adaptable to your special needs.

New Delta Power-Feed Drill Presses



Incorporate many special features and offer a wide range of feeds. Include single and multiple spindle 17" units, in slow speed and high speed models, with table-raising or head-raising mechanisms.

Send for CATALOG

Don't judge the value of Delta drill presses to your shop by their low cost. Get the facts! Fill out the coupon and send for the complete catalog of Delta low cost drill presses.



DELTA

MILWAUKEE

THE DELTA MFG. CO.
602-G E. Vienna Avenue, Milwaukee, Wis.

Please send me catalog of Delta Machines, giving specifications and prices on Delta Drill Presses.

Name _____

Address _____

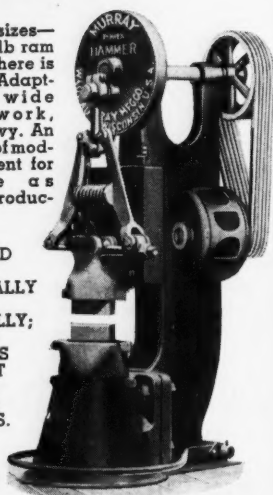
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State _____

POWER DRIVEN FORGE HAMMERS

Made in 5 sizes—
25 lb to 500 lb ram
(illustrated here is
250 lb ram) Adaptable
to a wide
range of work,
light or heavy. An
ideal piece of modern
equipment for
maintenance as
well as production
work.

OPERATED
EITHER
MECHANICALLY
OR
ELECTRICALLY;
THESE
HAMMERS
ARE NOT
STEAM
OR AIR
HAMMERS.



Adjustment for different thicknesses of dies and material is provided—an outstanding Murray feature. Extremely powerful, yet simple in design, and so flexible in operation Murray Power Driven Forge Hammers can be operated under perfect control, with little effort. Stability is built into them, and this means longer life and less maintenance cost. The ram design is a special feature. Ram is free from any obstruction thereby assuring full vision of the work, which makes possible use of longer guide. Write for details, and ask us about our repair and parts service.

D. J. MURRAY MFG. CO.
Wausau, Wisconsin

Established in 1883. Offices in Principal Cities

bench-grating of the compartment where operations are performed is made of hardwood so as not to produce sparks if struck with a grinding wheel or tool. Thus, the possibility of having sparks ignite the magnesium dust created in the grinding, buffing, or polishing operations performed within the booth is practically eliminated. As an added protection against spark ignition, the booth sections are lined with Masonite.

An automatic control maintains the water level at a uniform height in the tank below the bench-grating, thus eliminating the possibility of the tank becoming dry and thereby endangering the safety of the operator.

Photoswitch Photoelectric Blackout Alarm Control

A photoelectric control for operating blackout or air-raid alarm systems located inside factories has been developed by Photoswitch Incorporated.



Photoswitch Photoelectric Blackout Alarm Control

CLOSE SHAVES *for* TANK GEARS



STANDARD procedure in the finishing of highly accurate tank transmission gears today is by shaving and lapping. The reason is that where real accuracy is needed, crossed-axis finishing is reducing finishing time per gear to as little as 1/5th, the equipment cost to 1/6th, and tool cost per gear to 1/8th that required by other methods of producing accurate gears.

Developed originally by Michigan Tool Company to improve quality and lower production cost of automobile gears, the crossed-axis gear finishing process is rapidly becoming universal, regardless of whether such gears are required in job-lots or on a mass production basis: for motor vehicles, for tanks, for machine tools, for aircraft, etc.

Today there are "Michigan" gear shaving and "Michigan" gear lapping machine types available for virtually every size of spur or helical gear needed in the war effort—and in the peace to follow.

We will be glad to send you a copy of "Better Gears" to help you in the selection of methods and machine types needed for your specific war-production requirements.

**MORE GEARS ARE FINISHED ON "MICHIGANS"
THAN ON ALL OTHER MAKES COMBINED**

MICHIGAN TOOL COMPANY

7171 E. McNichols Road

Detroit, Michigan

Chestnut St., Cambridge, Massachusetts.

In use, the control is placed in a convenient location so that it views a centrally controlled street lamp, and is connected to alarm systems located throughout the factory. Thus, when the street lamp is turned out, the alarm systems inside the factory are immediately sounded. According to the manufacturer, the control is designed to operate independent of a momentary flickering of a street lamp, also independent of ambient light conditions.

Special-X Industrial Concentrate

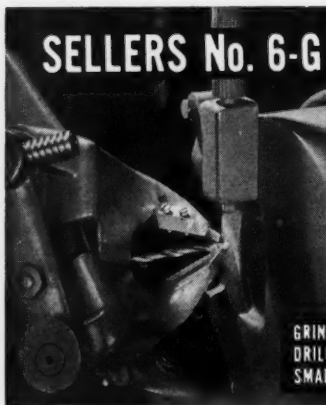
Known as Special-X Industrial Concentrate, an improved liquid soldering flux which can be used full strength or diluted to suit the job has been placed on the market by Industrial Service Laboratories, 7656 W. Forest Home Ave., Milwaukee, Wis. According to the manufacturer, the material is extremely powerful yet is so mild that it will not injure or discolor the base metal being soldered. The flux is designed for use

in soldering stainless steel, Monel metal, alloy copper, brass, iron, zinc, and practically every other metal and alloy except aluminum.

According to the manufacturer, Special-X Industrial Concentrate is now being used in war production to fabricate various items such as diver's helmets, submarine controls, machine gun parts, motor controls, refrigeration expansion valves, screening equipment, and chemical tanks and machinery. The material, it is claimed, can be readily used by unskilled workmen to produce high tensile strength joints easily and quickly. In addition, Special-X Industrial Concentrate is said to be noninjurious to hands or clothing and has a mild, pleasant odor.

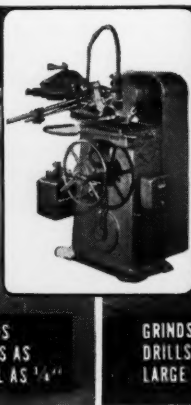
Binks Automatic Shell Coating Machine

The illustration shows a shell coating machine for automatically spraying the inside and outside of 75 to 105 mm shells at a rate of from 200 to 500 per



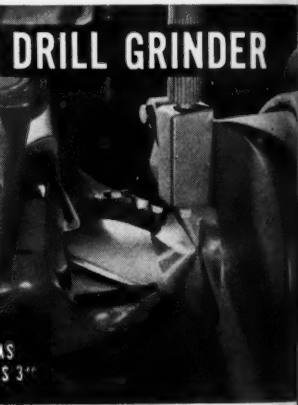
SELLERS No. 6-G

GRINDS DRILLS AS SMALL AS 1/4"



DRILL GRINDER

GRINDS DRILLS AS LARGE AS 3"



WM. SELLERS & CO., INCORPORATED, 1614 Hamilton St., PHILADELPHIA, PA.

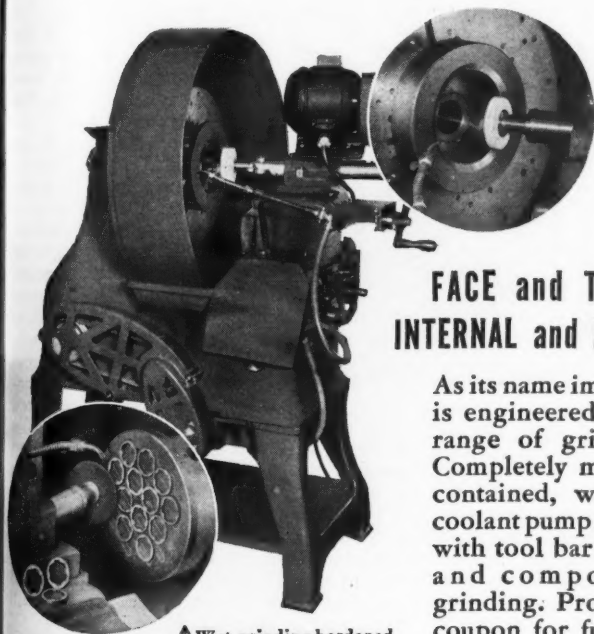
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a mild

NOT ONE . . . BUT MANY JOBS
can be handled on the

LEMPCO MULTI-PURPOSE GRINDER



← Internal tapers and angles are typical of the many "quick set-up" operations that can be handled.

FACE and TAPER GRINDING INTERNAL and EXTERNAL GRINDING

As its name implies, this machine is engineered to handle a wide range of grinding operations. Completely motorized and self-contained, with heavy built-in coolant pump and tank. Equipped with tool bar for rough turning and compound for taper grinding. Prompt delivery. Use coupon for full details!

↑ Wet grinding hardened pieces, using a magnetic chuck. The Lempco Grinder stepped up production on this job.

PROMPT DELIVERY
MAIL COUPON TODAY
For Illustrated Circular

LEMPCO PRODUCTS, Inc.
BEDFORD, OHIO

PRECISION TOOLS . . . OUR 24th YEAR

Send full details and prices on
Multi-Purpose Grinder.

Name.....

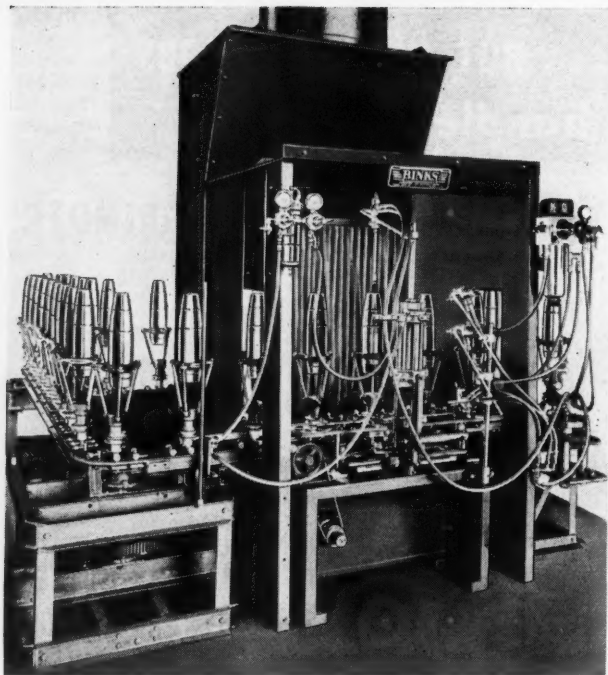
Firm.....

Address.....

City.....State.....

**FACTORY REPRESENTATIVES
IN EVERY PRINCIPAL CITY**

Binks Automatic Shell Coating Machine



shells in front of the automatic spray guns, which spray the exteriors of the shells. The shells then move, still rotating, to a position where a pneumatic spray gun plunges down into the interior cavity of each shell as it rotates, completely spraying the inside. Following this operation, the shells move away from the oscillating mechanism and continue on the conveyor for the required

hour which is now being built by the Binks Mfg. Co., 3114-40 Carroll Ave., Chicago, Illinois.

In use, the shells are loaded on a moving conveyor in a specially designed work holder, which holds the shells in position. As the shells pass in front of the Binks Water Wash Spray Booth, an oscillating mechanism engages the spindle of the work holder, rotating the

time to complete an air dry. When the shells are dry, they are unloaded and packed for shipment to shell loading plants.


The Binks Automatic Shell Coating Machine is equipped with an ingenious device known as a "Skip Spray" unit, which is so designed that should a shell be missing on the conveyor, the gun will not spray, thereby wasting no paint.

"OUTWEARS

the best

Bronze Metal"

20 years



without
a drink—

ARGUTO OILLESS BEARING CO.

Wayne Junction, Philadelphia, Pa.

Regrind Even Scores of Times

Today the most solemn issue is Unity of Purpose. Adaptability becomes a blessing. Duty is intensified by facts. Production persistently heads the worksheet. And "save" is an hourly command.

With the spirit of conserving STEEL, TIME, LABOR, and MONEY, the Severance Tool Company increasingly serves the Metal, Wood, and Plastic Industries with small Rotary Power Tools for Fitting and Finishing. Supplanting ordinary Rotary Files, MIDGET MILLING CUTTERS in standard shapes and sizes are available with little or no delay. Cooperate with National Needs by ordering less than you believe you require; then enjoy at least an equivalent compensation, plus hidden savings through "Regrinding," which removes only about .004 of an inch.

Regrinding revolutionized the field of Rotary Files and Severance has regrinding histories of upwards to the unheard-of-figure of eighty times. Contact Severance and try a cutter. These are trying times.



"Chatterless" Countersinks, Tube Deburring Cutters, and Engineering Service for Special Tools also await your request. Pacific Coast users and prospects may address Severance Tool Company, 3844 South Santa Fe Avenue, Los Angeles, California.

SEVERANCE
TOOL COMPANY
1516 East Genesee Avenue
SAGINAW MICHIGAN

MIDGET MILLING CUTTERS
"Ground from the Solid After Hardening"

FINISHING THE *JOB*



**An
exact
size
for every
job!**

Chicago Wheels were the first small wheels mounted on steel shanks. Today there are over 200 different shaped wheels to serve you—made in a variety of abrasives, grains and grades, mounted on shanks of various lengths and diameters of 1/4", 3/32", 1/8" and 3/16".

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BEHIND THE LINES..

Keeping up with Uncle Sam's victory drive for more tanks and guns and planes, Chicago Mounted Wheels are doing a big finishing job in shops everywhere—taking care of every kind of delicate or tough grinding job faster, smoother and better.

CHICAGO

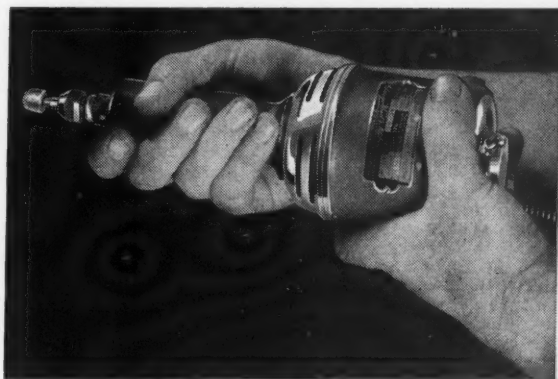


MOUNTED
WHEELS

...de of V/T Super Bond, they have real stamina, give unmatched performance and last 150% to 300% longer than ordinary wheels.

HI-POWER GRINDER

...real production grind-
...that is saving many
...hours. Weighs 3
...yet is so well bal-
...anced that fatigue is
...practically eliminated.
...s enough power to
...ve a 2½" diameter
...wheel. 17,000 r.p.m.
...case with 3 Chicago



...mounted Wheels, Drum Sander and Bands, extra Collets, Wrenches,
...essing Stone, \$38.50.

TRY ONE ABSOLUTELY FREE

...us the kind of job, size and wheel speed you use, and we'll send
...a test wheel postpaid.

CHICAGO WHEEL & MFG. CO.

Makers of Quality Products for 40 Years

301 W. Monroe St.,

Dept. MM,

Chicago, Ill.

Canadian Distributors: Canadian Trade Corp., Ltd., 1332 Williams St., Montreal

BRAND NEW CATALOG

...t off the press, this book is
...pared in the modern man-
...— loads of illustrations,
...cise descriptions of the
...complete line of Chicago
...ounted Wheels.

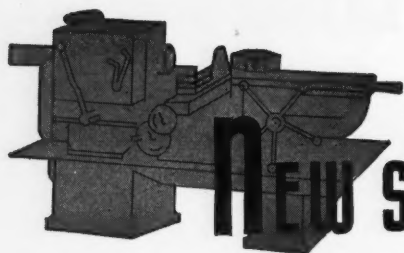
☐ Send Hi-Power ☐ Catalog

☐ Free Wheel Size _____

Name _____

Address _____

MM-7



NEW SHOP EQUIPMENT

Simmons 120 x 96-Inch Heavy Duty Planer

The Simmons 120 x 96-Inch Heavy Duty Planer shown in the accompanying illustration has been brought out by the Simmons Machine Tool Corp., 1745 N. Broadway, Albany, N. Y. Features of the machine include inner guide box table, double-length enclosed bed having forced feed lubrication to ways, and power rapid traverse to all heads, operating through specially designed clutches. Traverse and feed are interlocked so that both cannot be engaged at the same time.

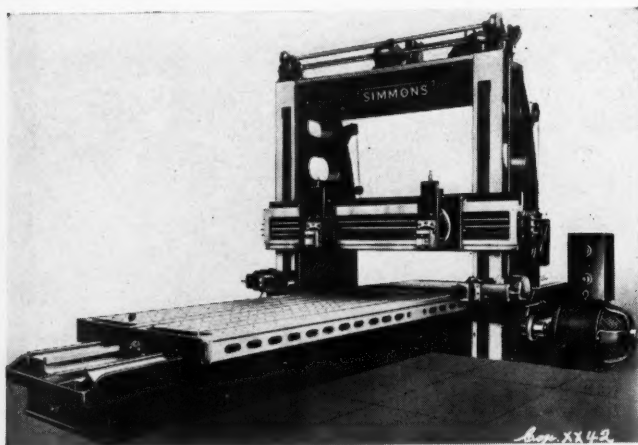
The inner guide box table has one flat and one V-way, riding constantly on a film of oil delivered by pump into bed channels for the entire length. The bottom side of the table is entirely closed, and heavy ribs at short intervals connect the top and bottom firmly together. The stop holes in the table are drilled from the solid to the center core, thus keeping the holes free from chips at all times.

Sykes herringbone gears, delivering a smooth, even flow of power, are used on all drive shafts up to bull gear and pinion, which have spur teeth to mesh with the table rack. All drive gears and table rack are of high strength steel. All shafts revolve with the gears and run in bronze bearings lubricated by forced feed.

Electrical equipment of the machine includes constant potential reversing motor drive with 50 h.p., d.c., 230-volt, 150-900 r.p.m. motor control, providing table speeds from 19 to 115 feet per minute. Additional features of the machine include box arch full depth of housing, ball thrust bearings on rail and side-head feed screws, adjustable taper gibbs throughout, micrometer collars for horizontal and vertical feeds, power elevating device for rail, completely covered gearing, and rail clamp on inner and outer edge of housings.

The Simmons 120 x 96-Inch Heavy Duty Planer is available with table having working length of 20, 24, 30, and 34 feet. Specifications of the machine

with 20-foot working length table are as follows: maximum width between housings, 124 inches; maximum height under bridge, 110½ inches; maximum height under cross-rail, 97½ inches; total length of table, 21 feet 11 inches; total length of bed, 40 feet 11 inches; width of table, 96 inches; diameter of



Simmons 120 x 96-Inch Heavy Duty Planer

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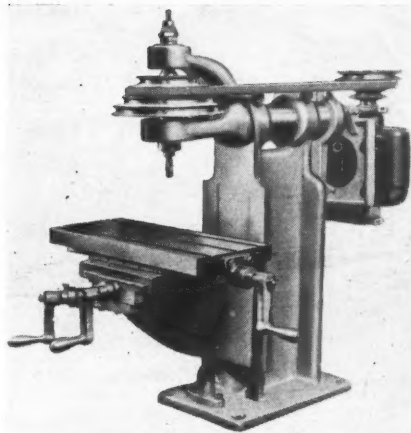
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step pin holes, $1\frac{1}{8}$ inches; width of T-slots, $1\frac{1}{2}$ inches; face width of rail, $30\frac{1}{2}$ inches; length of down feed, 28 inches; face width of housings, 18 inches; face width of table rack and bull gear, 15 inches; cutting speeds of table, 19-115 feet per minute; size of motor, 50 h.p.; speed of motor, 150-900 r.p.m.; approximate weight, 165,000 lb. The specifications of the machines having table with 24, 30, and 34-foot working lengths are the same as those for the above machine with the exception of the total length of table, total length of bed, and approximate weight.

Duro Vertical Bench Milling Machine



Duro Vertical Bench Milling Machine

Said to be equally adaptable to tool-rooms and high speed production lines, a precision vertical bench milling machine has been announced by the Duro Mfg. Co., 800 E. 61st St., Los Angeles, Cal. The machine incorporates precision taper roller bearings in the spindle and is said to have a runout of 0.0003 inch. Convenient, splined, disengageable handles operate micrometer adjustments for each direction of table move-

ment, the table having a vertical travel of 7 inches, longitudinal travel of 8 inches, and transverse travel of 5 inches.

The one-piece solid spindle support arm of the Duro Mill is equipped with an adjustable graduated dial and index

NEW

BOTTLENECK BREAKERS

Semi-Special Marschke Grinders and Buffers are handling scores of special war production jobs efficiently. Armor plate and tank turret grinders are the latest. Others are pictured here. Every machine is typically smooth running, rugged and dependable, adapted from standard machines by Marschke engineers.

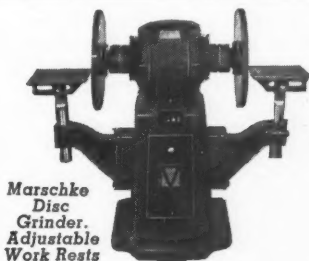


If you have a grinding or buffing bottleneck, ask us for suggestions on a semi-special Marschke. Or write for Catalog of 70 standard Marschke Grinders and Buffers to

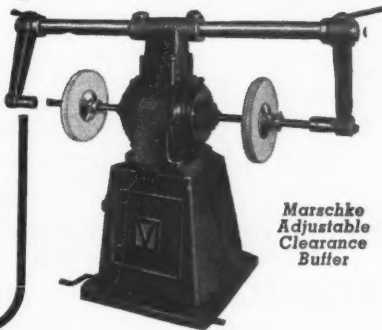
VONNEGUT MOULDER CORP.

1804 Madison, Indianapolis

Marschke Adjustable Spot Grinder or Buffer



Marschke Disc Grinder. Adjustable Work Rests



Marschke Adjustable Clearance Spot Buffer

**Speed Production
Save Tool Room Time!**

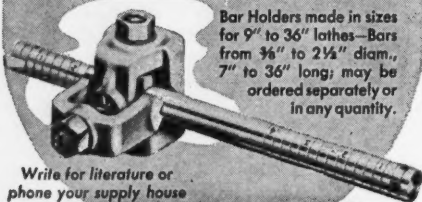
**Use CLAYTON
Boring Bars and Holders**

- ★ add extra production hours to every shift
- ★ make heavier cuts without chatter

Clayton Boring Bar Holders offer a new 2-way clamping arrangement which: 1) permits changing or adjustment of any size boring bar within the capacity of the holder, without disturbing alignment with lathe; 2) maintains identical setting for subsequent operation when holder is removed from the lathe; 3) provides rigidity for making heavier cuts without chatter; 4) no "fingering" adjustments or bushings required for any operation.

You can get quick deliveries of Clayton Boring Bars, and save needless tool room time. They offer these superior features: 1) permanently calibrated quarter inch graduations which eliminate necessity for file or chalk marks; 2) minimum surface tension eliminates chatter and allows heavier cuts; 3) bit holes accurately broached to eliminate vibration and to insure rigidity of bit.

Speed your war production by using Clayton Boring Bar Holders...relieve your tool room of costly, time consuming bar-making work by using Clayton Boring Bars.



Bar Holders made in sizes for 9" to 36" lathes—Bars from 3/8" to 2 1/2" diam., 7" to 36" long; may be ordered separately or in any quantity.

Write for literature or
phone your supply house

CLAYTON
MANUFACTURING COMPANY
Alhambra • California

pin. Adjustments can be made to 60 deg. either side of center. The extra heavy semi-steel cast frame and spindle arm is said to absorb all excess vibration, thus permitting accurate operation to one-thousandth of an inch.

A unique "floating" motor mount maintains proper tension of the V-belt at all times and permits instant manual change through the four spindle speeds of 450, 850, 1,400, and 2,100 revolutions per minute.

Libert Hi-Speed Shear with Foot Pedal Control

Libert Machine Co., Green Bay, Wis., announces that all models of its Hi-Speed shear are now available with foot

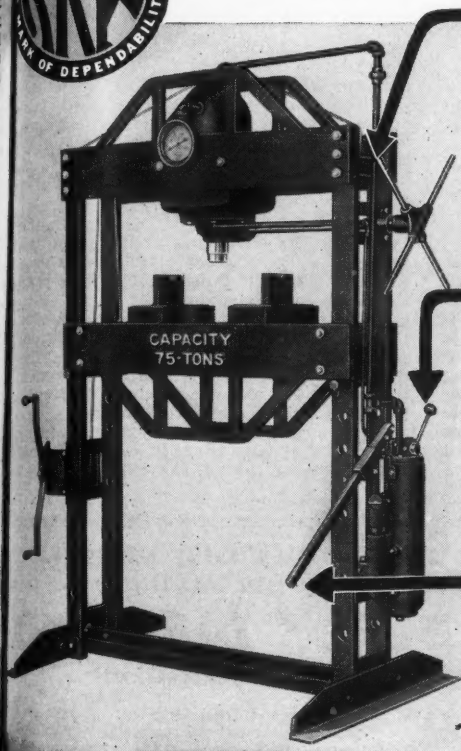


Libert Hi-Speed Shear with Foot Pedal Control

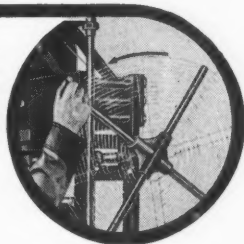
pedal control, including two redesigned models Nos. 1060 and 1430 which are 60 and 30-inch throat machines with 10 and 14-gauge capacity respectively. These particular models, which are capable of cutting rings, circles, splits, plain and irregular shapes, flat or formed pieces in a wide range of metals, are said to be particularly useful in aircraft and other war plants.

Two new shears have also been added

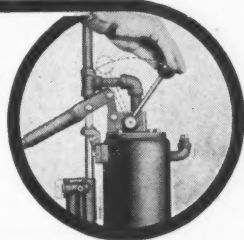
Here's how **SPEED** is built into HYDRAULIC ARBOR PRESSES



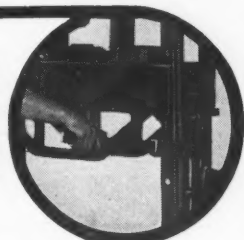
1 SPIN THE HAND-WHEEL and the ram speeds to the work by fast mechanical action instead of slow, laborious hydraulic pumping.



2 FLIP THE BALL ARM to close the valve instead of slowly turning a hand-wheel type control.



3 START PUMPING and immediately get tons of pressure on the work because the hydraulic cylinder was automatically filled with oil during operation No. 1.



• The new KRW Presses are designed for **SPEED...speed** in bringing ram to the work...**speed** in developing hydraulic pressure...**speed** in raising ram to remove the work. The "capstan" type handwheel raises the ram with the same mechanical speed employed in lowering it.

A Two Speed Pump, controlled by a

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to the Libert line; namely, Models 1260 and 1460 with 60-inch throats and capacity up to 12-gauge and 14-gauge mild steel respectively. Both models are of electric-welded steel construction with V-belt single speed drive and foot pedal control, and have standard ram construction, the ram requiring only two easy adjustments for most shearing jobs—adjustments for length of stroke and depth of penetration. Each machine is designed so that foot pedal opens blades for receiving material while machine is in operation. Blades operate on a new principle by which material is sheared, not punched, leaving a clean, smooth edge which is said to require no further finishing.

Snyder Heavy Duty Hydraulic Turning Machine

A heavy duty double-end hydraulic turning machine designed to greatly increase turning production is now being built by the Snyder Tool & Engineering Co., Detroit, Mich. A feature of the machine is the hydraulic feed, which is operated from a single hydraulic power unit in the rear of the machine. This

unit furnishes power to both front and rear toolslides of the machine as well as to the tailstock.

Movement of the tailstock is controlled by a hand-operated valve, which facilitates loading and unloading of the workpiece by pushing the piece forward into the center drive fixture. The right-hand tool bracket, when swung into clearance position, provides a loading platform in line with the locating surface in the center drive. When the workpiece is loaded and pushed into place between centers, it is clamped manually and the tailstock locked in place, ready for the first of two turning operations to be performed by the machine on the piece.

A further function of the hydraulic system is the actuating of the front and rear toolslides. A single cylinder is used to cam the two front slides into position, at which point the cams stop moving and the toolslides are traveled through their work cycle. Each front toolslide has its own hydraulic cylinder, and the slides are racked together to permit the use of a single hydraulic and electrical control. Likewise, the rear toolslides are kept synchronized by a pair of hydraulically actuated cam plates, which move the slides through

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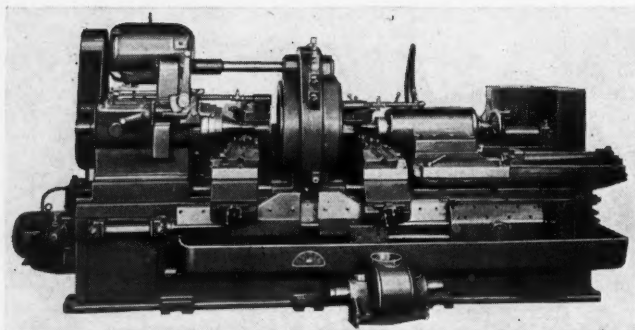
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Snyder Heavy Duty
Hydraulic Turning
Machine

and is equipped with an oil reservoir from which the oil is carried to the bearings and gears by means of the main gear in the drive.

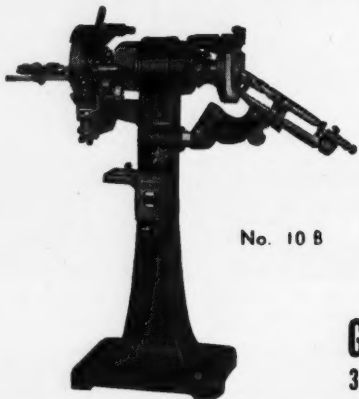
a rapid advance and feed cycle.

The control for the entire machine consists of a start-and-stop push button, a cycle start push button, and an emergency return, these being mounted on the center drive directly in front of the operator. The machine is equipped throughout with anti-friction bearings, the headstock, which employs a twin-plate friction clutch between the motor drive and the spindle, being equipped with an oil pump for pressure lubricating. The center drive is mounted on a pair of extra large Timken bearings

The base of the machine is of welded steel construction, well ribbed for rigidity, and the machine itself is constructed with very heavy cross sections in all vital parts. The base serves as a large chip trough and coolant container, chips being removed from the rear of the machine. The coolant is circulated to the cutting tools by a motorized pump at the rear of the machine. Fine chips in the coolant are removed by thorough screening and by passing the liquid over a series of baffles to precipitate fragments.

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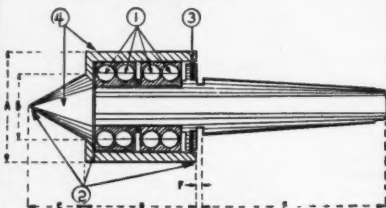
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Blank & Buxton Improved Index High Speed Vertical Milling Machine

Blank & Buxton Machinery Co., 3110 E. Michigan Ave., Jackson, Mich., announces a change in the vernier mountings on its Index High Speed Vertical

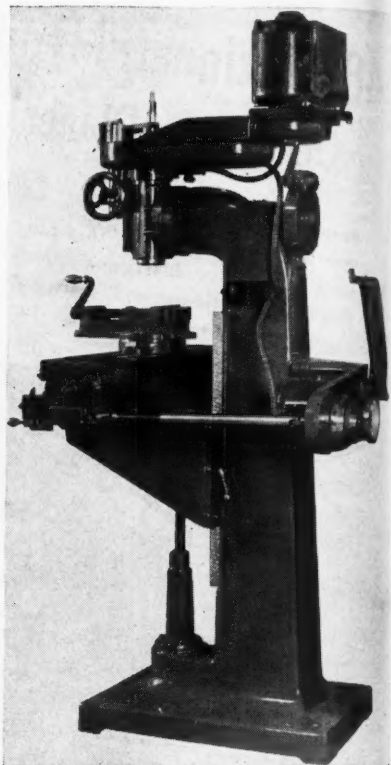


Fig. 1—Blank & Buxton Improved Index High Speed Vertical Milling Machine

Milling Machine shown in illustration Fig. 1 herewith. In the past, the vernier scales were flush-mounted, making it necessary for the operator to stoop to read them. Now they are mounted on an angle, as shown in illustration Fig. 2. That the cross vernier has been moved from the front of the knee to the back where it can be more easily read is also readily noted.

An added feature of the machine is a mechanism in the head which provides

Index
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Vertical

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They know from actual experience! They know that the consistent record for accuracy, high production and long life that is part of every Barnes Blade is no mere accident. It is the result of careful manufacture by an organization devoted to making metal cutting blades exclusively for over twenty-three years. Barnes Blades have honestly earned this splendid reputation and will continue to merit the confidence of the men who use them, the men who "know they're Better".



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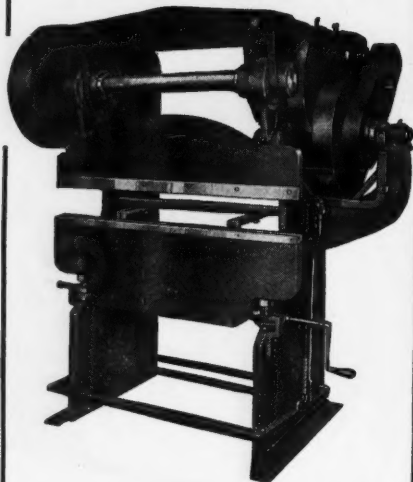
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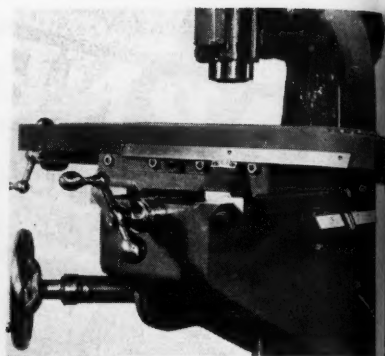


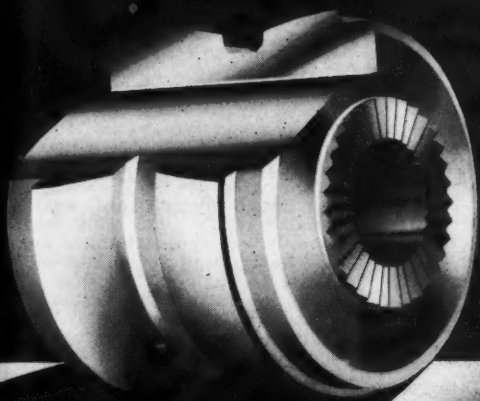
Fig. 2—Illustration showing angle mounting of
vernier scales on Index High Speed Vertical
Milling Machine

power feed to the spindle, as shown in
illustration Fig. 3. This feature has
been made available in answer to nu-
merous requests from men who have
been using the machine for precision
boring of jigs, fixtures, and intricate
small parts. The machine can now be
used to mill, drill, and bore an area
8 x 16 inches at one setting. Power
feed to the table is also available for
the machine as an extra, thus making
the machine particularly adaptable for
production work.

The spindle of the Index High Speed
Vertical Milling Machine operates in su-
per precision preloaded ball bearings.

Fig. 3—Illustration of head of Index High
Speed Vertical Milling Machine showing power
feed mechanism for spindle





A simple tool or a tool of the most complicated design . . . all are of equal quality and workmanship.

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packed in special grease, and is provided with a No. 9 Brown & Sharpe taper. The machine is recommended for use with tool steel end mills up to 5/8 inch but can also be used with larger cutters. Additional specifications of the machine are as follows: quill movement to spindle, 3 1/4 inches, with power feed optional; swivel of head, 90 deg. either way; working surface of table, 8 x 22 inches; overall length of table, 30 inches; standard spindle speeds (6), 180 to 2,400 r.p.m.; special spindle speeds (12), 120 to 3,700 revolutions per minute.

Simmons Heavy Duty Lathe

To meet the demand for rigid, powerful machine tools for use in performing extra heavy metal-working operations, the Simmons Machine Tool Corp., 1745 North Broadway, Albany, N. Y., has brought out the heavy duty all geared head lathe illustrated herewith. The lathe is manufactured in 48 and 54-inch sizes.

The headstock is of simplified design to provide the required range and number of spindle speeds with a minimum of wearing parts. It is fully enclosed

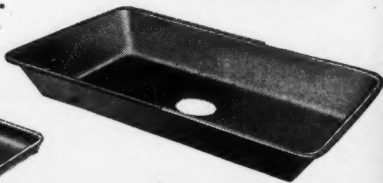
and all bearings and gears are constantly lubricated from a positive-pressure pump which delivers filtered oil, the filter being easily accessible for cleaning. The headstock has long bearing on bed ways, thus ensuring rigidity, and is bolted directly to the bed.

The headstock spindle is a hammered steel forging, heat treated and accurately turned and ground to size. Spindle bearings are extra long and large in diameter to provide a maximum area of bearing surface to compensate for the heaviest loads. All gears and shafts in the headstock are made of heat treated S.A.E. 4640 alloy steel. Either four or six speed changes are provided to the internal faceplates of the headstock through sliding spur tooth gears and one heavy jaw clutch. The faceplate ring gear is of alloy steel with an outside diameter equal to that of the faceplate to which it is bolted. A direct-reading chart shows selection of spindle speeds.

The carriage is designed with an extra long bearing on wide flat ways, and the carriage bridge is of wide, deep construction to properly compensate for heavy tool thrust loads. Gibbed both front and rear, the carriage can be locked firmly in any position on the

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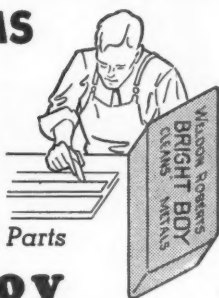
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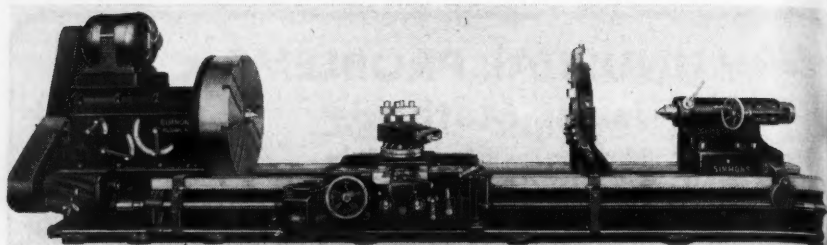
Newark, N. J., U. S. A.

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Simmons Heavy Duty Lathe

bed for heavy duty cross feeding, and is provided with power feed for lateral and cross movements. The compound rest has graduated power angular feed and is equipped with two tool straps with four heavy bolts for firmly clamping tools.

The apron is of double-walled unit construction with bearing supports for all shafts and studs both front and rear. All gears in the apron are of heat-treated alloy steel. Feed levers and lead screw nut are interlocked for safety, and all levers are conveniently located for quick operation.

The tailstock is clamped to the bed

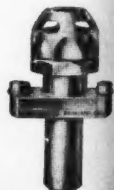
by means of four bolts and is also held in position by engagement of pawl with rack in the center of the bed. The tailstock is moved along the bed by rack and pinion and compound gears. The upper section of the tailstock is arranged with set-over adjustment for turning light tapers.

The tailstock spindle is a high carbon steel forging, turned and ground to size, and travels in a honed bearing in the tailstock barrel. A rigid locking mechanism firmly clamps the spindle without distorting alignment. The hand-wheel controlling the travel is located at the front of the tailstock for con-

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Middletown, N. Y.

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venience of the operator.

The bed of the lathe is of massive design, consisting of heavy thick double walls running the length of the machine which are connected together by means of double-walled cross girts of one-piece construction. Bed ways are extra wide.

The taper attachment furnished with the lathe is designed to provide a maximum taper of 5 inches per foot in lengths up to 48 inches at one setting. The cross feed screw of lathe is furnished with a guide block which swivels with the slide that determines the taper. For straight turning, the guide block is locked in position. The lead screw of the lathe is 2½ inches in diameter and is accurately milled from high carbon Cumsco screw stock.

Wickman Optical Form Grinder

A grinder designed to finish grind to a very high degree of accuracy any flat or circular form tools, punches and die profile gages, templates, and many other regularly or irregularly shaped parts, to be known as the Wickman Optical Form Grinder, is now being marketed by the Wickman Corp., 15533 Woodrow Wilson Ave., Detroit, Mich. The machine is said to be particularly adaptable to the grinding of tungsten carbide as well as hard tool steels.

Actually, the Wickman Optical Form Grinder is a fully universal tool grinder with pantograph controlled optical checking instrument. The grinding head is provided with a wheel slide which moves up and down at 80 strokes a minute across the contour of the part to be ground. The work is clamped to the table and its position controlled and set by compound slides.

Prior to the grinding operation, a 50:1 layout is prepared on any paper of non-deforming quality, which is fastened to a plat located above the machine. This plat is adjustable and may be locked so that its position remains unchanged while grinding is in progress. In conjunction with the layout plat is a 50:1 pantograph, which has a 30-power microscope on the short arm and a pointer on the long arm which the operator moves from point to point along the line of the layout. The microscope is arranged with rotating cross hairs, the intersection of which corresponds to the position of the pointer on the long pantograph arm. As the operator moves the pantograph pointer, the intersection of the cross hairs moves correspondingly at 50:1 reduction.

Backing Up The Men At The BATTLE STATIONS

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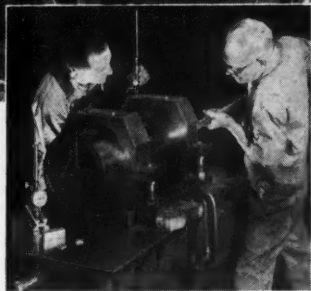
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(UPPER PICTURE)

Checking dimensions of Trunnion Bearing Boxes with a Starrett Micrometer No. 224 and Vernier Height Gage No. 454. Photos courtesy of Goss Printing Press Co.

(LOWER PICTURE)

Surfaces are scraped to limits of plus or minus .0001"—an operation that calls for frequent checking with precision measuring tools. The operator in the background is using a Starrett Vernier Height Gage with Starrett LAST WORD Indicator attached. Starrett Dial Test Indicator No. 665 is shown in the foreground.



These scenes in the plant of the Goss Printing Press Co. show skilled American workmen building heavy caliber anti-aircraft guns for the U. S. Navy... a job that has already won the coveted Navy "E" pennant for excellence. In this plant, as in most plants throughout the "Arsenal of Democracy," Starrett Precision Measuring Tools are helping to maintain the highest standards of accuracy... helping to produce more and better planes, tanks, ships and guns for the fighting men of America.

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HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES



Wickman Optical Form Grinder

The wheel head assembly can be adjusted to any desired position or angle by three radial slides. Its path across the contour of the work is manually determined by lateral and longitudinal cross slides.

The grinding wheel is fed to the point established by the intersection of the cross hairs and its exact position observed through the microscope. Since the work is viewed directly in the operating plane, the wheel is always fed up to the determined point on the work. Thus, the accuracy of the grinding oper-

ation is not affected by wheel wear.

The 2-inch stroke of the wheel permits a number of thin pieces to be stacked together, a feature which is said to be particularly ideal when producing small quantities of precision parts which must be identical. The machine is designed to grind a form $5\frac{1}{4}$ inches in length and $2\frac{3}{4}$ inches in depth in parts 2 inches thick. The layout size is 20 inches square, thus making it possible to grind an area 0.400×0.400 inch in one setting. Profiles greater than 0.400 inch square in area can be handled by special methods.

By means of the same equipment but reversing the procedure, parts can be inspected without taking them out of the machine. The machine is also said to enable the contours of a part to be recorded or transferred on a drawing 50 times its size, thus producing an accurate layout of any form for which no detail drawing is available.

All necessary equipment for grinding flat work, including electrical equipment for regular alternating current, is furnished as standard. A wheel dresser, capable of dressing straight faces to any required angle, is also provided as standard equipment. This dresser, however, is used only when straight lines are being ground on the work. All irregular forms are ground with wheel dressed by hand.

The machine is provided with upper and

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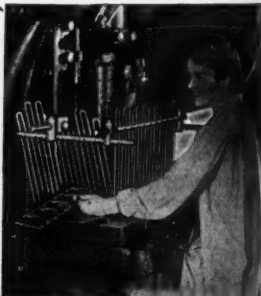
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Today Webber Gage Co. is the largest exclusive manufacturer of gage blocks in the U. S.

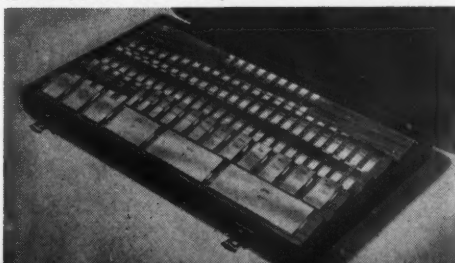
In the modern Webber plant more gage blocks than ever are being produced under the finest manufacturing methods and with the wide experience of Webber technicians.

Whether it's Vitamins for weapons or peace-time goods after the weapons have successfully done their work, you can safely rely on Webber Gage Blocks.

Webber

GAGE COMPANY

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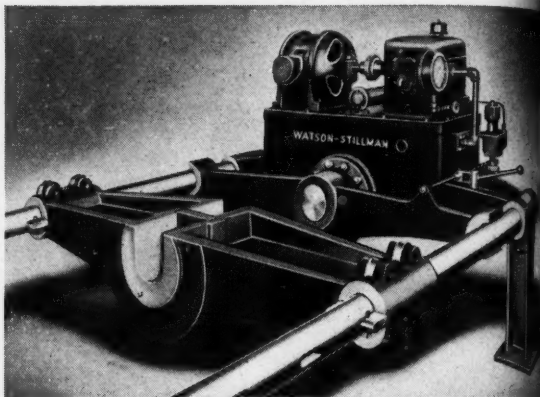


Write for new folder.

Prompt delivery to firms furnishing high priority.

**Watson-Stillman No. 8676
100-Ton Forcing Press**

lower light to illuminate the work being ground. To prevent grit and dust from getting into the parts of the machine, a completely filtered exhaust system is built into the base, the filter being readily removable for washing at any time. The entire machine, including layout plat, occupies a floor space of $61\frac{1}{4}$ x $45\frac{1}{4}$ inches.



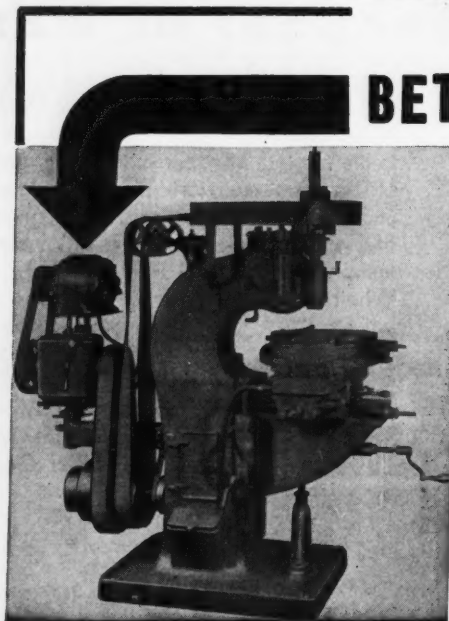
**Watson-Stillman No. 8676 100-Ton
Forcing Press**

A 100-ton forcing press for use in forcing shafts into rotors as well as for other forcing operations has been brought out by The Watson-Stillman Co., Roselle, N. J. The press, which is designated as the No. 8676, is completely self-contained, including a 10 h.p.

motor and variable delivery radial piston pump. Control of the press is effected by a single hand lever.

Of a horizontal two-bar type, the Watson-Stillman No. 8676 Press is provided with an opening which is adjustable from 24 to 120 inches and stroke of ram of 18 inches. Advance speed of the press is 200 inches per minute, pressing speed is variable from 0 to 25 inches per minute, and return speed is 140

The DRIVE to BETTER PRODUCTION



Today, production is all important. Every available machine tool should be utilized and those that are old need modernization—a job that can be efficiently accomplished with a Berkeley Drive.

There is no machine in your plant that we cannot efficiently motorize. We manufacture a drive suited to your requirement. V-belt — Helical Gear — Variable Speed (P.O.S.) — or Quick Change Gear Drive. Each drive is custom-built to your particular machine. This is accomplished by the Arc Welded Steel Bracket Construction.

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THE BERKELEY EQUIPMENT CO.
CORY PENNSYLVANIA

KE *Guesswork* OUT OF PRODUCTION



Put SUNOCO EMULSIFYING CUTTING OIL to work . . . for long tool life . . . accuracy . . . fine finish

Victory production — the steady stream of machined parts for finished war products — isn't achieved by guessing. The selection of the proper tool set-up, correct speeds and feeds, and the right application of the right cutting lubricant are all important for machine tool operation at rated capacity-plus.

That's why so many leading plants throughout the nation rely on Sunoco Emulsifying Cutting Oil and the recommendations of Sun Oil Engineers to meet their cutting oil needs.

Sunoco's exceptional heat-absorbing and lubricating qualities permit longer tool life,

"nth" degree accuracy, and fine surface finish. Sun Oil Engineers — those capable Doctors of Industry — offer you technical service based on scientific training and practical experience that will help you solve your machining problems. Their recommendations are not guesswork. They stand ready willing . . . and able to help you in your plant. For helpful case histories on how they aided other leaders in the metal working industry, write for your free copy of "Helping Industry Help America."

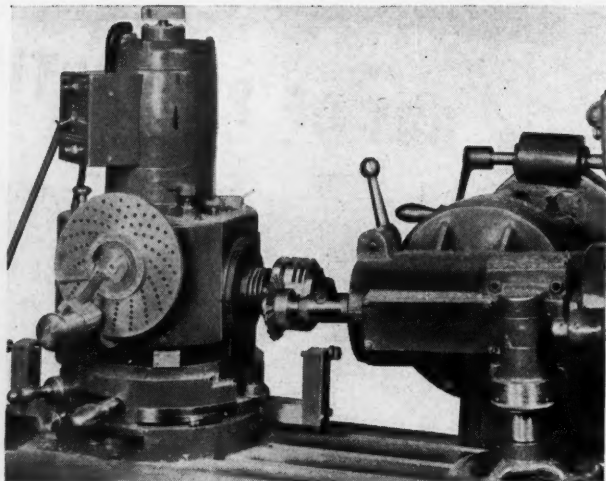


SUN OIL COMPANY • Philadelphia, Pa.
Sun Oil Company Ltd., Toronto

SUNOCO

PERFORMANCE DATA
APPLICATION — Tapping
MACHINE — 3-1/2 Gisholt
Lathes
MATERIAL — Forged
CUTTING LUBRICANT
Sunoco to 15
water.

IN PETROLEUM PRODUCTS **HELPING INDUSTRY HELP AMERICA**



Haxton Thread Miller

inches per minute. The gap in rear abutment of press is designed for holding shafts up to 6 inches in diameter. Distance between horizontal bars of machine, 72 inches; weight of machine, 10,000 pounds.

Haxton Thread Miller

The illustration shows the Haxton Thread Miller, a compact, self-contained unit which can be attached to the bed of a milling machine, lathe, or precision grinder, which has been brought out by the Haxton Marine Machine Corp., 76 Front St., East Rockaway, N. Y. The unit does the entire job of holding the work, turning it at the proper speed, and providing the necessary lead for the kind of thread desired—the milling

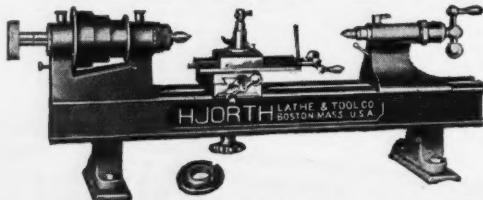
mined by setting the lower index. The upper portion of the machine also carries the motor which supplies power both for turning the work and advancing it at the proper lead rate. The length of thread that can be cut in one operation may be controlled to suit the needs of the work at hand. An easily made adjustment enables the operator to rotate the work without advancing it when desired.

The Haxton Thread Miller is said to operate on a new principle which advances the work under the cutter with a minimum of backlash. The machine is designed to provide a lead for any type of thread, the lead being accurately established by simple setting of index scale on base of machine. Thus, any kind of precision thread cutting job, it is claimed, can be quickly set up and completed even by an operator of only

machine simply provides the cutting tool. The work can be held in a collet, chuck, or faceplate.

The Haxton Thread Miller consists of a substantial base and a movable upper portion. The base is provided with a graduated index scale for determining the lead of the thread to be milled. The upper part of the machine holds the work and forms a unit which moves laterally, advancing the work under the cutting tool at a rate which is deter-

... for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

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**SINGLE POINT
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WITH DIAMONDS**

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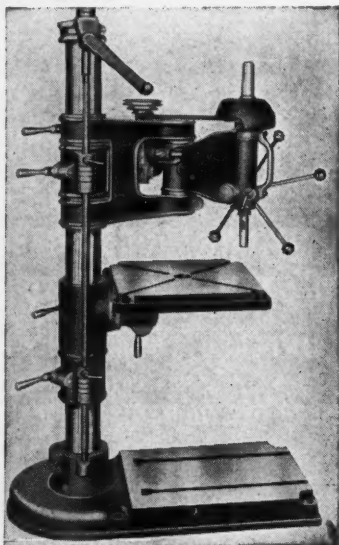
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320 YONKERS AVE., YONKERS, N.Y.

START NOW!

Increase Production

End Worker Fatigue By Making
Your Drilling Job Easier.



Use the DRILLMASTER RADIAL DRILL

This floor type, heavy duty, precision-made, well balanced Radial is economical in initial cost and operating cost. It offers many features that merit your careful consideration. Drills to the center of a 36" circle . . . No. 2 Morse taper . . . Heavy duty $\frac{1}{2}$ h.p. ball bearing motor . . . Full floating, ball bearing spindle assures free and sensitive operation at all speeds.

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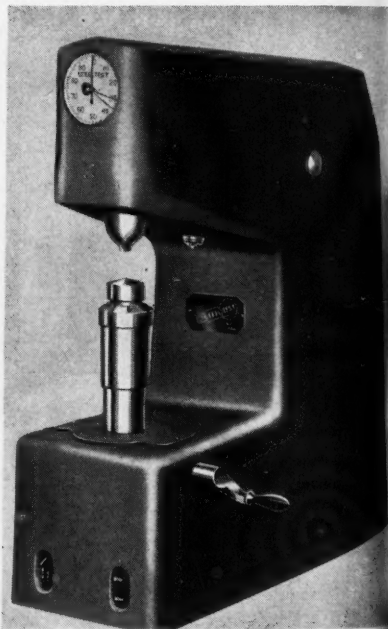
St. Louis • Missouri

ordinary experience, whether producing a standard, metric, or fractional thread or thread of other pitch for any special purpose. The machine can also be used for cutting helical gears.

The Haxton Thread Miller is available in three sizes; namely, No. 1 with spindle capacity of 1 inch in diameter, No. 2 with spindle capacity of $1\frac{1}{2}$ inches in diameter, and No. 3 with spindle capacity of 3 inches in diameter.

"Steeltest" Production Hardness Tester

The Steeltest Instrument & Mfg. Co., 14212 Fenkell Ave., Detroit, Mich., has introduced the "Steeltest" Production Hardness Tester shown herewith, which is said to have a maximum capacity for making 2,400 accurate hardness tests per hour. Provision is made for hopper-fed continuous cycle or hand-feed single cycle operation. Conversion from continuous to single cycle foot-switch operation is instantly made by the flick of a switch, which controls an ingen-



"Steeltest" Production Hardness Tester

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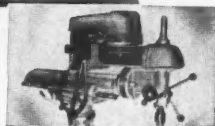
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MULTIPLIES MAN-POWER!

WALKER-TURNER Radial Drill

• Here is a machine that has solved many problems in our War Industries. Extensively used for drilling, tapping and routing. Aviation plants use many for stack-drilling sheets and spars and for other operations. Ship-builders, too, use them for drilling plates and sheets. And these are only a few of dozens of different applications. Priced from \$325 with motor, shipment can be made in from 4 to 6 weeks to plants engaged in war production. • Send for literature.

WALKER-TURNER CO., INC.
772 Berckman St. Plainfield, N. J.



• Model RD1175-J has built-in ball-bearing jack-shaft, permitting speed range from 110 to 5400 R. P. M. with 1140 R. P. M. motor.



• Ball thrust bearing on column of Model RD1175-J makes it easy swiveling head to left or right. Improves accuracy . . . and lessens fatigue.



• On all models the head can be tilted to 45° left or right.

Walker-Turner

Company, Inc.
Plainfield, N. J.
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WALKER-TURNER MACHINE TOOLS FOR METAL, WOOD AND PLASTICS

DRILL PRESSES • BAND SAWS • BENCH SAWS • TILTING ARBOR SAWS • LATHES
JIG SAWS • RADIAL SAWS • RADIAL DRILLS • BELT AND DISC SURFACERS • JOINTERS
SPINDLE SHAPERS • GRINDERS • FLEXIBLE SHAFT MACHINES • CUSTOM BUILT MOTORS

ous electrical braking system incorporated in the instrument.

Direct readings of actual hardness numbers in all standard Rockwell scales are obtained on a 100 division dial with one set of black numerals. Penetrator is standard 120-deg. cone with 0.2 mm. radius, which is interchangeable with chucks for $\frac{1}{8}$ and $\frac{1}{4}$ -inch steel balls.

A "dead weight" loading system applies 10 kg. minor and 60, 100, or 150 kg. major loads through a uniquely compensated loading beam actuated by a direct coupled uniform motion cam

drive. Power supply is a 1/15 h.p., 60 cycle, 110 volt, a.c. type, arranged with 60 to 1 reduction unit.

According to the manufacturer, operation of the Steeltest Production Hardness Tester is not affected by climatic conditions. Hardness testing with the instrument is said to be practically automatic, the only manual operation being the hand elevation for initial setting of one specimen in each batch run and the feeding of the specimens. Correct initial setting is assured by a red flasher located at operator eye level.

Southern Engineering Metal Forming Machine

Developed primarily to reduce production time of forming extruded sections to various shapes, the metal forming machine shown in the illustration is announced by the Southern Engineering Co., Inc., Los Angeles, Cal. The machine consists of two basic sections; namely, a movable head onto which dies are bolted, and air ram to which mating die is attached. A 5 h.p. variable speed reversible transmission system drives the head through reduction gears and a pinion system at an infinite range of speeds between 91 and 275 inches of travel per minute. Using normal air-line pressure, a total of 2½ tons pressure is said to be exerted by the air ram.

Formation of straight extruded sections into the desired shape, which may involve any number of changes in plane as well as profile, is accomplished by attaching one end of the straight section to the movable die and then drawing it between the movable die and the die block located on the air ram. The metal is tightly confined to the cavities of the die, and is said to be formed to the desired shape without wrinkling

MUNDING BENCH RADIAL DRILL

Combines the convenience and accuracy of a sensitive drill, the range and capacity of a large drill, with the speed and flexibility of a radial. Finger-tip selection of speeds. Table swivels and tilts to any angle.



UNEQUALLED RANGE

Drills to center of 48" dia. circle, 18" travel of head on arm. 17" travel of arm on column. ¾" drill capacity. Speeds: 175 to 3675 r.p.m.

Write for details.

MUNDING MFG. CO.

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HINGES

VARIOUS WIDTHS and GAUGES



BUTTS AND CONTINUOUS LENGTHS

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S & S MACHINE WORKS

4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS

For GUARDS CABINETS CASES BOXES

This simple idea saves *tons of steel* and thousands of dollars



Several years ago, Millers Falls engineers went to work on an idea that's paying the country generous dividends today . . . dividends in part money, but more important, in desperately needed steel, transportation, storage space, handling, and paper work. The idea was just this:

A full 50% of the potential cutting power of every hack saw blade was wasted because only one edge of a blade was a cutting edge. If teeth could be put on the second edge, there would be savings in everything but the actual milling of the teeth. Prime obstacles were drag and wear on the trailing edge. Intensive experimenting solved the problem with a special "set" and special heat treating. After thorough tests, the new two-edged blade was put on the market at a price only 50% above single-edge blades.

That was 18 months ago. Now Millers Falls "Double-Life," the high-speed molybdenum alloy blade, is proving its value. In almost every plant where Double-Life is given thorough tests, it becomes the standard specification for machine sawing.

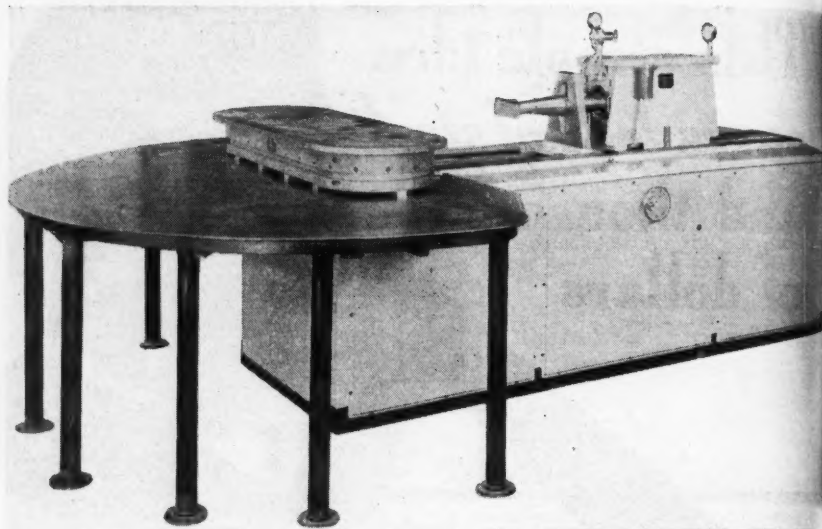
This simple idea is saving America thousands of dollars and tons of vital steel.

Millers Falls Company

Manufacturers of Fine Hack Saws, Precision Tools, Hand Tools,
and Portable Electric Tools

Greenfield, Mass.





Southern Engineering Metal Forming Machine

and with a minimum of internal stresses.

Three types of movable heads are available—a circular head for the forming of parts which have a symmetrical radii or an interrupted radii with no straight sections, slow sweeps, curves, and offsets, and a straight head which travels only in a straight line for the forming of wing spar caps, stringers, and all other longitudinal parts which have relatively small sweeps or changes in plane. The first two types of head can be rotated forward or backward or through a full 360-deg. circle.

Designed for easy operation, the Southern Engineering Metal Forming Machine can be used to form such ma-

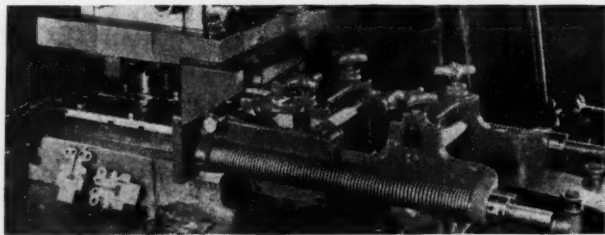
terials as magnesium, dural, and stainless steel as well as aluminum alloys. With the use of a mandrel, tubular sections, it is claimed, can be formed as easily as conventional extrusions. The machine can also be used to make open seam tubing, flanged tubing, and Z sections.

Southwark 200-Ton Hydraulic Pipe Bending Press

The Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia, Pa., has brought out the 200-ton oil-operated hydraulic pipe bending

DICKERMAN DIE FEED

FOR QUICK SET-UPS ON SHORT OR LONG RUNS



Handles coiled stock of any practical thickness. Maximum stock width 4". Adjustable from 0 to maximum feed length of 3" in increments of .001". Accurate.

**H. E. DICKERMAN
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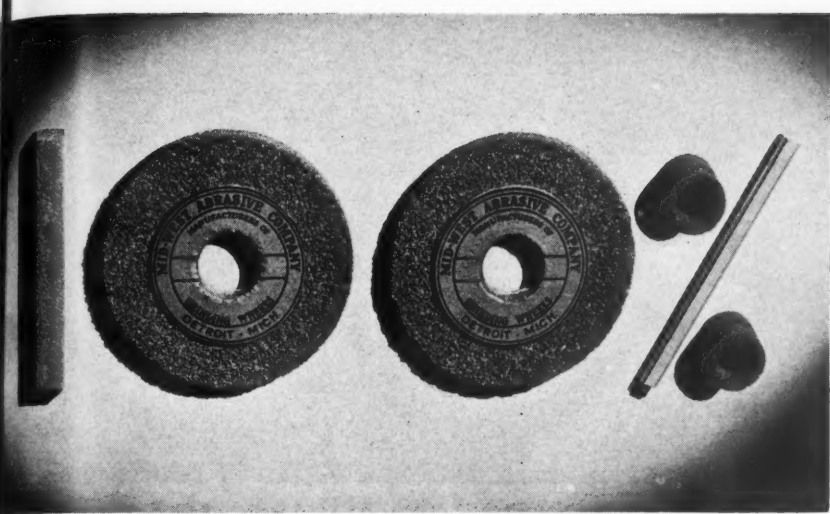
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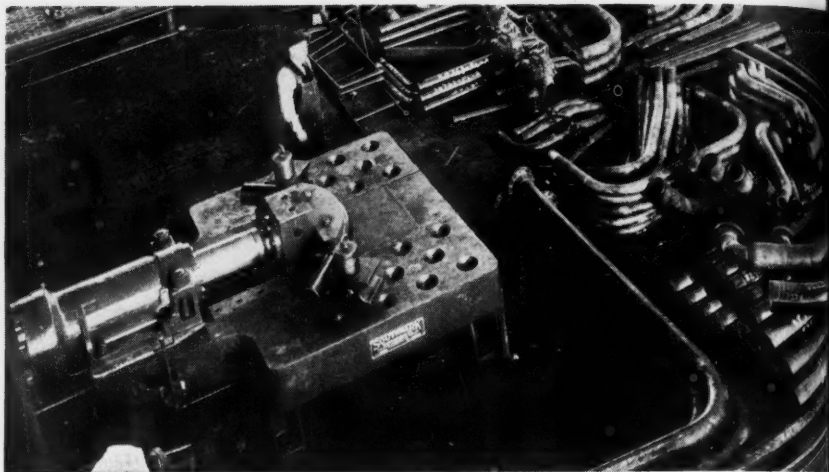
LIKE the English merchant who "Caters to the King," we are proud to announce that virtually one hundred percent of the guns being manufactured for the United States Navy as well as a large majority of those produced for the United States Army are honed with MID-WEST honing stones.

That is a simple statement of fact but to us it means recognition of excellence by our armed forces which more than justifies the many years of research and toil and training that went into development of these highly efficient stones. We contend that we manufacture the world's finest abrasives—honing and superfinishing stones, grinding wheels, emery cloth, sandpaper—and we submit that the selection of MID-WEST stones by our Army and Navy is ample proof of that claim.

The accuracy and fire power of our big guns, as our enemies are learning, are second to none in the world and the MID-WEST ABRASIVE COMPANY is extremely proud of its contribution to that prowess. May our guns continue to fire far and true and potently until those who would destroy our way of living are themselves destroyed conclusively.

MID-WEST ABRASIVE COMPANY
Manufacturers of grinding wheels, sandpaper and emery cloth.
1960 E. Milwaukee Ave. Detroit, Michigan

MID-WEST ABRASIVES



Southwark 200-Ton Hydraulic Pipe Bending Press

press shown in the accompanying illustration. Due to its tremendous power, the press is said to bend most pipe cold, thus not only saving heating time but also eliminating possibility of pipe becoming distorted due to cooling.

Self-contained, the Southwark 200-Ton Hydraulic Pipe Bending Press is said to be under perfect control of the operator at all times, a feature of particular value when making difficult bends.

Falcon BWM Full Muffle Electric Box Type Furnace

The Falcon line of electric furnaces manufactured by H. O. Swoboda, Inc., 148 13th St., New Brighton, Pa., has

been augmented by a full muffle electric box type furnace designated as the BWM. Designed primarily for fritting and glazing ceramics at temperatures up to 2,000 deg. F., the furnace is also said to be highly efficient for heat treating high speed tool steels, hardening, tempering, and many other toolroom and laboratory heating applications. Principal advantages claimed include economical operation, long operating life at maximum temperature, and quick heating.

A highly desirable construction feature is a new type center pivoted door which swings away from the workman thus protecting the latter from exposure to heat of inner door surface. Other construction features include a full box type muffle and all-refractory hearth, completely surrounded by heating elements.



**STOPS
BREAKING
OF TOOL BITS**

because a hardened tool steel bearing, electrically welded in place, supports tool bit against heavy cuts.

Catalog
S-41

THE READY TOOL CO. 510 Iranistan Ave., Bridgeport, Conn.

If your production involves CUTTING-OFF OPERATIONS

THESE BLADES SHOULD BE ON YOUR MACHINES

FIG. 1

EXCESSIVE
FRICTION ELIMINATED

FIG. 2

FIG. 3

You can see by referring to Fig. 1 that a chip produced by a blade of the conventional type will be flat. The cutting action of the blade causes this flat chip to expand and jam against the walls of the cut, creating excessive chip friction which results in rapid breakdowns of the blade.

A chip issuing from the Luers Blade (Fig. 2) assumes a curved shape conforming with the hollow-ground top of the blade. In this curved form the chip is free to collapse into the concave top of the blade and cause the least amount of contact with the restricting sidewalls. Excessive friction is eliminated.

But this is not the only factor that tends to eliminate excessive friction. The liberal side clearance provided by the dis-

tinctive T-shaped design of the blade (Fig. 3), too, serves to reduce friction.

Since this side clearance and the hollow-ground top both extend the full length of the blade, it is apparent that neither of these surfaces require regrinding. They both remain unchanged. That means that the task of sharpening is very simple—so simple, in fact, that even an unskilled operator can do it. Only the front face, or cutting edge, is ever sharpened.

A special gauge permits even an unskilled operator to restore the blade exactly to its former position.

Tell us what equipment you use and we will gladly let you try one of these blades and holders in your own plant under your particular conditions.

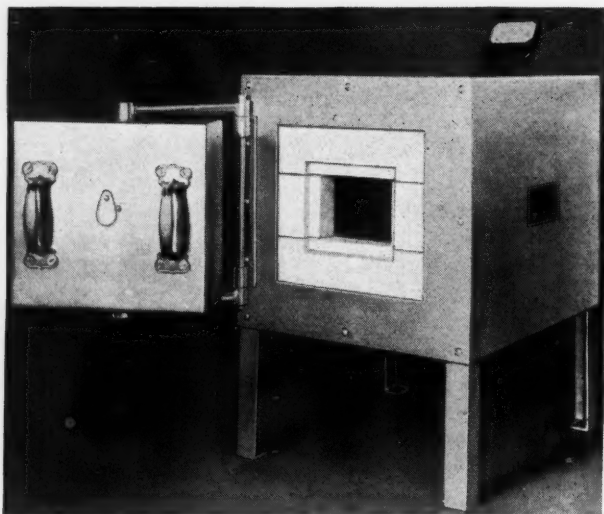
Blades, both tapered and parallel on the longitudinal cutting width, carried in stock.

PRODUCED UNDER LICENSE ISSUED BY
JOHN MILTON LUERS PATENTS, INC.

The Blades that
reduce friction

EMPIRE Tool Co.

8774 Grinnell Ave.
Detroit, Mich.



Falcon BWM Full Multi-Electric Box Type Furnace

The furnace shown in the illustration is arranged for bench mounting but is also available in floor mounting style. The furnace, which has a capacity of 3 kw., is sturdily built, employing high quality refractory block throughout and heavy steel casing and frame construction. The unit is designed for operation on 110 or 220 volts, single phase current, and is furnished complete with indicating pyrometer. Automatic temperature controls are supplied either mounted

designed to eliminate temperature variations in the hearth chamber. Chamber dimensions are 3 $\frac{3}{4}$ inches high x 5 $\frac{1}{4}$ inches wide x 12 inches deep.

directly on the furnace or separately mounted. The BWM furnace is also available in temperature ranges up to 2,300 deg. F., with various types of doors

Faster, Better Filing for more effective war production

Many finishing operations on machines and equipment for the National war effort require accurate hand-filing. With "American-Swiss" Swiss Pattern Files, such operations, especially on intricate or precision jobs, can be done with best results in least time because of the uniformly hard, deep, sharp teeth in the extra-long filing surface of these files.

For more than 40 years, "American-Swiss" Files have been preferred by experienced and discriminating file users.

American Swiss File & Tool Co.

Elizabeth, N. J.



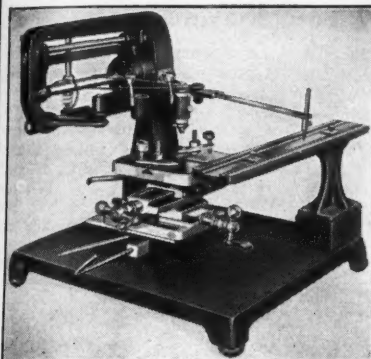
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SWISS-PATTERN FILES

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PRODUCTION *Pantograph* ENGRAVER

for lettering and numbering on panels, indicator plates, plug sleeves, range-finder bands, etc.



FEATURES

Unskilled labor can produce uniform engraving on flat or uneven surfaces of brass, aluminum, soft steel and plastics.

Moving of engraving spindle to and away from work is controlled by spring pressure. It permits placing of tracing stylus in groove of master before bringing cutter into control with work, which means more accuracy and much more speed in operation.

Adjustable ratio of Pantograph is 1:5 and 1:2.5. Standard machine is equipped with universal vise which handles all types of indexing, layout and spacing work.

Write for illustrated Catalog, Type A.

NEW HERMES INC.
821 BROADWAY NEW YORK, N. Y.

ATLANTIC

NON-TEMPERING
TOOL STEEL

In the New Steel Shape

FLUTAGON

The SAFETY
STEEL

This new steel shape furnishes a convenient, positive grip for chisels, punches, cutters and blacksmiths' tools.

This shape minimizes chipping and splintering.

Drawing of temper to suit different requirements is unnecessary and completely eliminated. Suitable hardness is obtained by merely heating the tool and quenching it in water.

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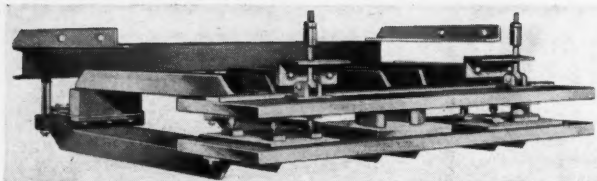
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ATLANTIC STEEL CO.

1775 BROADWAY

NEW YORK • NEW YORK

Developers of Non-Tempering Tool Steel



Leslie Universal Die Set

The Leslie Universal Die Set is said to greatly increase the range of work that can be done on press brakes and to make practical and economical the use of these machines for many stamping and blanking operations on large sized sheets or plates that heretofore could be performed only with extremely large straight side presses. Not only is the die set designed to permit handling of work of almost unlimited length and width (throat depth) but is also said to provide accurate die alignment without the use of leader pins.

Screws and dowels for attaching punch plates and dies to punch holders and die shoes are readily accessible while the die set is in press brake, thus enabling individual punch and die assemblies to be removed for repairs or changed without disturbing the rest of the setup. The die set is also said to

In addition, the Leslie Die Set, it is claimed, requires no special attention and can be safely and continuously operated by less skilled men, releasing skilled operators for more exacting work.

be designed so as not to throw lateral or torsional strains on the press brake, thus reducing breakdowns.

Oil-Rite Constant Level Lubricator

Designed to ensure adequate lubrication at all times and prevent oil waste and the deterioration or spoilage of material caused by oil throw, the Oil-Rite Constant Level Lubricator shown in the illustration is now being manufactured by the Oil Rite Corp., 3466 S. 13th St., Milwaukee, Wis. The lubricator is designed for use on electric motors, pillow blocks, pumps, ventilating fans, gearboxes, and so on, wherever bearings and other machinery parts

Preloaded Precision Bearings for Spindles

MOREY 12M
HIGH-SPEED
VERTICAL
PROFILER
and MILLER

Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.

TOOL ROOM TIME AND MONEY SAVER

LINLEY High Speed Vertical Milling Machine and Jig Borer

Micrometer Screw Feed Quill assures smooth, accurate boring to any predetermined depth up to 3". Direct reading eliminates errors.

Also made in bench model.

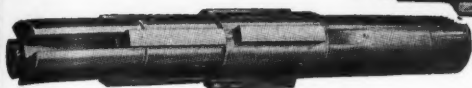
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LINLEY BROS. CO.
15 Montauk St. Bridgeport, Conn.

War Production Means: More Production!

ORDER NICHOLSON EXPANDING MANDRELS



**TYPE A
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DESIGN**

Prices
Subject to
Change

Size No.	Range of Bores Taken	Net Price
1A	$\frac{1}{8}$ " to 1"	\$12.00
2A	$\frac{1}{4}$ " to $1\frac{1}{2}$ "	16.00
3A	$1\frac{1}{2}$ " to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00

(Other Sizes taking up to 7")

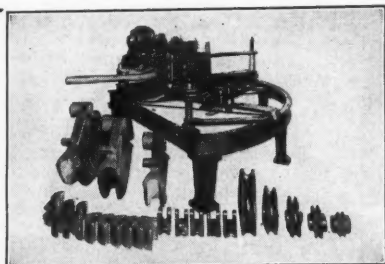


TYPE B—STRAIGHT JAW DESIGN

Size No.	Range of Bores Taken	Net Price
1X	$\frac{1}{8}$ " to $\frac{3}{8}$ "	\$10.00
2X	$\frac{3}{8}$ " to $2\frac{1}{32}$ "	11.00
3X	$2\frac{1}{32}$ " to $\frac{3}{4}$ "	12.00
00	$\frac{3}{4}$ " to $\frac{7}{8}$ "	14.00
0	$\frac{7}{8}$ " to 1"	16.00
1	1" to $1\frac{1}{4}$ "	18.00
2	$1\frac{1}{4}$ " to $1\frac{3}{8}$ "	21.00
3	$1\frac{3}{8}$ " to 2"	29.00
4	2" to $2\frac{1}{2}$ "	40.00

ECONOMY TOOLS . . . for holding work while being machined between centers on lathes, grinders, millers, shapers, etc. Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin.

W. H. NICHOLSON & CO., 136 OREGON ST., WILKES-BARRE, PA.



THE AMERICAN COLD PIPE, CONDUIT AND TUBE BENDING MACHINES

QUICK DELIVERIES . . .

HAND OPERATED TYPES in capacities of 1 in., 2 in., 3 in., 4 in. **MOTOR OPERATED** in three capacities, $\frac{1}{2}$ in. to 4 in., $\frac{1}{2}$ to 6 in., and $\frac{1}{2}$ in. to 8 in.

Early shipments on hand operated machines; on motor powered from four to six weeks.

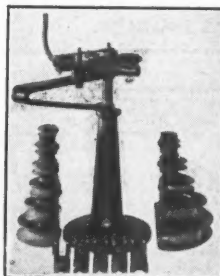
Wire or air mail letter for printed matter and prices.

Three New Machines: No. 1—For bending extra heavy pipe up to 3 in. No. 2—For bending all kinds of thin gauge tubing without use of mandrel. No. 3—For bending IPS conduit.

AMERICAN PIPE BENDING MACHINE CO., INC.

25 PEARL ST.

BOSTON, MASS., U. S. A.



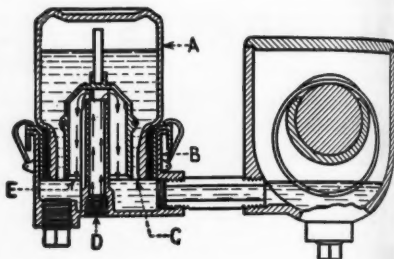
**FOR NATIONAL
DEFENSE
We Are Ready
To Serve You**

must be provided with an ample supply of lubricant.

The Oil-Rite Lubricator consists essentially of three simple parts. The base is cast of Zamak metal with an integral open air vent which extends part way up into the oil reservoir. Over this vent is loosely fitted an inverted bucket or bell, also cast of Zamak metal. The reservoir proper is a glass dome, sealed to a metal collar by a plastic porcelain cement which is said to be impervious to acids, oils, water, and heat. Two spring clips lock the oil reservoir in position. A felt gasket around the out-

side of the bell is seated against the narrow neck of the glass dome when the reservoir is removed, thus preventing waste of oil during refilling.

When the reservoir (A) is filled and

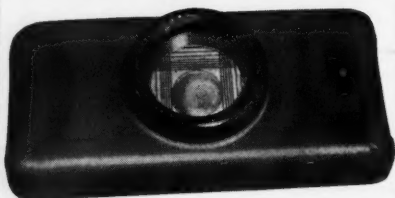


Oil-Rite Constant Level Lubricator

inverted into position on the base (B), the lower edge (E) of the inverted bucket or bell determines the oil level which the lubricator will maintain. When the level falls below this point, air from the vent (D) escapes under the side of the bell, as at (C), and passes up to the top of the lubricator, thus permitting oil to flow down until the level to be maintained is reached. Operation is entirely automatic. When the lubricator is used on machines which operate intermittently, the chamber formed inside the bell is said to provide adequate surging capacity for oil flowing back to the lubricator.

The Oil-Rite Constant Level Lubricator is available in four standard sizes with capacities of 2, 4, 8, and 16 ounces. Outlet tappings are provided at both side and bottom of base, and oil level to be maintained is clearly indicated. Air vent can be provided with filter if desired or can be installed with breather tube connecting to bearing.

"All-Way" LEVEL



The FELL Precision Level is made to show the level of all ways at once. This eliminates disturbing the first level when leveling the second. Graduations are in .0005" per foot and form squares about a circular bubble, thus giving co-ordinate readings and showing direction and amount of slope, if any.

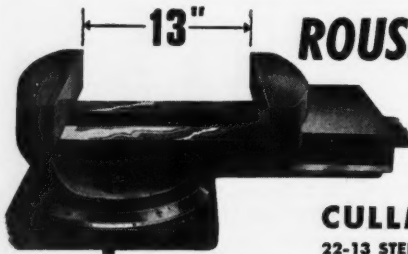
MADE IN TWO SIZES
5 1/2" x 12" 3 1/2" x 6"

Write for Bulletin

WM. B. FELL CO.

702 SOUTH ST.

ROCKFORD, ILL.



ROUSSELLE VICTORY VISES

Hardened and ground tool steel jaw plates open to full 13" capacity. Longer ways, heavy jaws, broad base and extra swivel bearing surface make this vise ideal for your big precision jobs. Made in 3 sizes—7", 10" and 13". Write for folder.

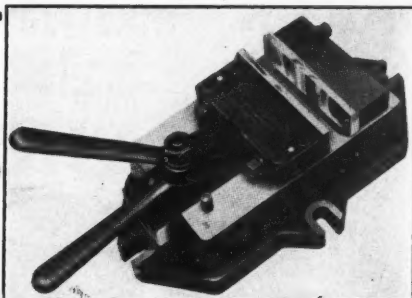
CULLMAN HUBER SALES CO.

22-13 STEINWAY ST.

LONG ISLAND CITY, N. Y.

The Hartford "Four-Point" Milling Vise

**POWER
SPEED**



**STRENGTH
ACCURACY**

Operator easily applies tremendous **POWER** with one hand manipulation of both binding and cam-faced handles.

Dual-operation principle of handles **SPEEDS** gripping and releasing and therefore reduces costs.

Maximum **STRENGTH** comes from semi-steel base and movable jaw of single heat-treated steel drop-forging.

Movable jaw, with its ground fitting surfaces, can **ACCURATELY** hold single piece at either end of jaw. Jaws are in absolute alignment.

WRITE FOR BULLETIN

THE HARTFORD SPECIAL MACHINERY CO., HARTFORD, CONN.

SHEAR-CUT HIGH SPEED END MILLS

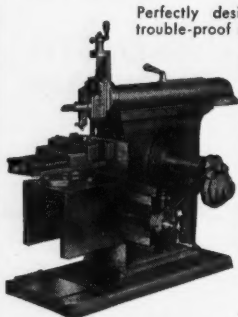
Here's a complete line of
Single and Double End Mills.

They save time and money.
SPECIFY PROGRESSIVE SHEAR-CUT END MILLS.
Write for catalog and prices.

PROGRESSIVE TOOL & CUTTER CO.
2345 WOLCOTT ST. **FERNDALDE, MICH.**

Lewis Semi-Finished 10" SHAPER

Complete with Vise — Prompt Delivery



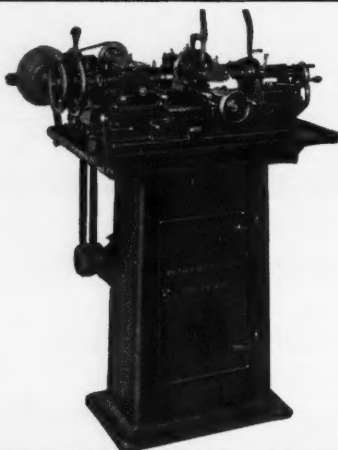
Perfectly designed, shop tested, trouble-proof construction. Exceptionally efficient. Will stand severest service. Quickly and easily adjusted. LEWIS SHAPER has 10" stroke, 10" longitudinal feed and 7" vertical feed. Complete — including semi-finished castings, necessary materials, blueprints and LEWIS 7" VISE CASTINGS.

Send today for catalog of Lewis Products with complete specifications . . .

LEWIS MACHINE TOOL COMPANY

Dept. T-7

P. O. Box 116, Sta. A., Los Angeles, Calif.



WALTHAM THREAD MILLER

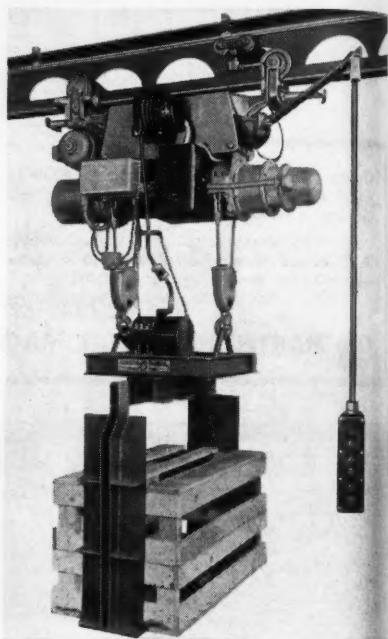
Can be furnished with a variety of equipments for tool room or manufacturing purposes. Write for new bulletin No. M.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

Cleveland Tramrail Motor-Driven Crate Grab and Carrier

A crate grab and carrier especially designed for the safe handling of crates and boxes in and out of storage or from one elevation to another has been developed by the Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., 1111 E. 283rd St., Wickliffe, Ohio. The unit is completely motorized with



Cleveland Tramrail Motor-Driven Crate Grab and Carrier

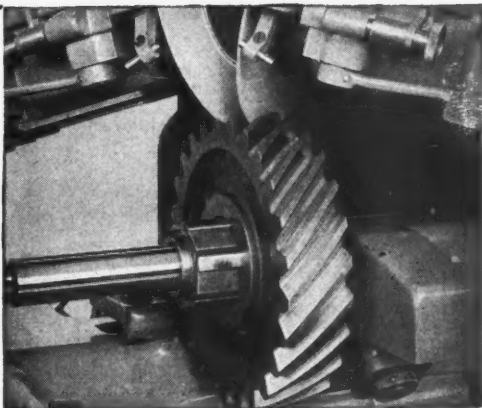
all operations conveniently controlled by six buttons of push-button station. If desired, the unit can be provided with operator's cab in which all controls may be located.

The arms of the grab are extended and retracted by means of geared slide bars which are driven by motor mounted on top of the grab. Power is supplied to this motor through a flexible cable which is held taut by a spring-type retrieving reel. A double-hook cable type electric hoist elevates and lowers the grab with very little swing, thereby making it easy to spot. A quick-acting electric brake stops and holds the load

High Precision Spur and Helical GEARS

Interchangeable — Quiet

Cut and ground on Maag Machines in our Jersey City plant to an accuracy of profile up to .00012" and to an accuracy of pitch up to .00024". Eccentricity of pitch circle, .00060".



**Or Gears cut to usual standards
without grinding.**

SWISS-AMERICAN GEAR MFG. CO.

5001 CHRYSLER BLDG.

NEW YORK, N. Y.

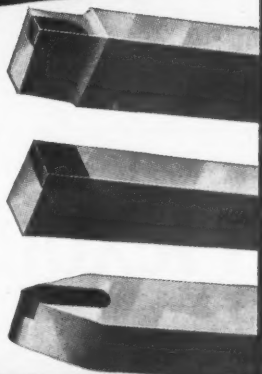
USE WILLEY'S GENERAL PURPOSE TUNGSTEN CARBIDE TOOLS!

Ready to ship, standard tools, handle 90% of most requirements. Tipped with Willey's Metal, they are suitable for machining cast-iron, tough hard rubber, bakelite, fibre and tough alloy steel steels.

Prompt delivery eliminates down time, increasing production and lowering costs. Low prices mean added economy. Special tools quoted on request.

WRITE FOR BULLETIN 142

Prices and full information on all grades, sizes and classifications of Willey's standard tungsten carbide cutting tools and blanks.



WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Highway,

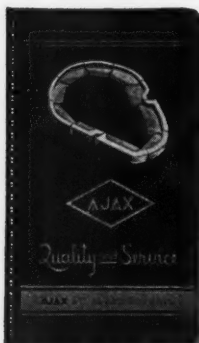
Detroit, Michigan

at any point desired.

The unit illustrated is designed to handle one or more boxes at a time, lifting loads up to 1,500 lb. a distance of 20 feet. The arms may be spread to a maximum of 36 inches and retracted to a minimum of 18 inches. Similar units can be built for heavier loads and to suit other dimensions.

F & H "Angle Machining Package"

An "angle machining package" designed to materially reduce set-up time



*Send for
Valuable
Booklet*
**Forgings
for All Industries**

**Rough Turned or
Finished Complete**

**Composite Die Sections, Extrusion Tools,
Crankshaft Forgings, Gear Forgings, Die Cast-
ing Dies.**

**Rings, Discs, Blocks, Shafts, Hubs, Bars, and
Special Shapes. Tool Steel of All Makes.**

S.A.E. Specifications.

Stainless and Copper Forgings.

MAY WE SERVE YOU?

AJAX STEEL & FORGE CO.
205 ADAIR ST. DETROIT, MICHIGAN

in the production of compound angles is announced by the F & H Mfg. Co., 6024 Ellery St., Detroit, Mich. The package consists of three parts; namely, an



F & H "Angle Machining Package"

F & H Universal Vise with improved locking control; a grinding wheel angle dressing attachment, and a unique swivel clamp for holding odd shaped workpieces.

The swivel clamp, which is known as an "Equi-hold," consists of two friction plates joined together by ball and socket, and fits between the workpiece and one jaw of the vise, being fastened to the latter. The design enables the clamp to readily adapt itself to the angle of the workpiece.

The F & H Universal Vise is of all steel construction, with hardened and ground steel jaws. Extreme precision in producing any angle—vertical, horizontal, or transverse—is said to be obtained by means of the vernier dials of

Flexoid TOOL HOLDER

Universal Head

"ONE TOOL DOES IT ALL"



Entire assembly including bit is rigidly locked by a single screw.

Does away with right, straight or left hand tool holders. No change in centers necessary when resetting—5 sizes.

STOCKED FOR IMMEDIATE DELIVERY

THE SMITH POWER TRANSMISSION CO.



**Write for folder
1545 E. 23rd St.
CLEVELAND, OHIO**

Rawhide HAMMERS Rawhide MALLETS



• Genuine Java Water Buffalo Hide replaceable faces in malleable head.

No.	Dia. in ins.	Wgt. in lbs.
0	1	1½
1	1¼	1¾
2	1½	1¾
3	1¾	2¼
4	2	4
5	2¾	5½



• A finely balanced Tool with tough, resilient Java Water Buffalo Rawhide heads.

Not Loaded

No.	Dia. ins.	Lgt. ins.	Wt. Ozs.
0	1	2½	2
1	1¼	3	3½
2	1½	3¼	6
3	1¾	3¾	7½
4	2	3½	10
5	2¾	4¼	21
6	2¾	4¾	23

Loaded Mallets

No.	Dia. ins.	Lgt. ins.	Wt. Ozs.
7	1¼	3	8
8	1½	3½	12
9	1¾	3¾	16
10	2	3½	20
11	2¾	4¼	42



• These are the tough, resilient, long-lasting Rawhide faces made from specially treated Java Water Buffalo hide for use in Chicago Rawhide Hammers.

CHICAGO Rawhide MFG. CO.

170 ELSTON AVE.,



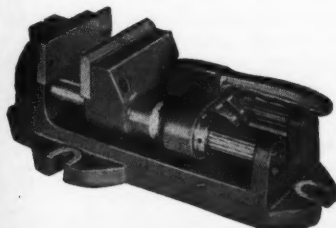
CHICAGO, ILLINOIS.

Can You Equal This Speedy Production Vise ?

Easier to Operate! Easier to Adjust!

Simply move sliding jaw up to work, then press down on lever. To disengage, just raise the lever and the jaw moves away from work. Quickly adjusted to different pressures for different kinds of metals, eliminating danger of distortion.

The only vise with a jaw that travels from "closed" to maximum opening (4½") at single movement of lever. Saves time in getting the work in and out of vise. Ideal as a drill-jig milling fixture, and for tool-room use.



Supplied with or without jig bushing plate. Saves time and cost of making special drill jigs for small production jobs.

D. A. SMITH & CO.

8085 Livernois

Detroit, Mich.

Free CATALOG

PRESTO-VISE

the vise. The vise is of compact construction, being only $4\frac{3}{4}$ inches high, yet the jaws are designed to open to a standard width of $2\frac{1}{4}$ inches. A weight of 14 lb. makes the vise easily portable.

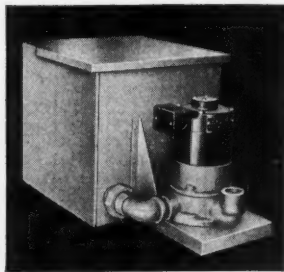
The grinding wheel dressing attachment, the third item comprising the F & H "Angle Machining Package," is designed to fit into the universal vise, thus eliminating the need for a separate angle wheel dresser. The dressing tool is said to be rigidly held at the correct "drag" angle for best dressing results.

Tank with Built-In Baffle Separator for Brady-Penrod Model 600 Replacement Coolant Pump

A tank with built-in baffle separator for use with its Model 600 replacement coolant pump is now being offered by Brady-Penrod, Inc., Muncie, Ind. The tank, which is 12 x 12 inches in size, is made of heavy galvanized sheet iron painted machine tool gray outside. The baffle separator is designed to collect the heavy chips of metal carried by the returning coolant fluid, thus ensuring efficient operation on the part of the

Model 600 pump. A removable lid permits the tank to be easily and quickly cleaned without disconnecting the return piping.

Designed for single or multiple installations, the Model 600 coolant pump



Tank with Built-In Baffle Separator for Brady-Penrod Model 600 Replacement Coolant Pump

and tank assembly can be readily adapted to any type of machine tool and may be used with any type of coolant in general use. The assembly is designed for continuous operation and may be easily transferred from one machine to another when a job is com-



Nameplate Detail Press

This machine quickly stamps details and serial numbers into name plates.

Write for Particulars

GEO. T. SCHMIDT, Inc.
1806 Belle Plaine Ave. Chicago, Ill.

EVEREDE TWO-STEP BAR



The ONLY Boring Bar with the economical triangular bit.

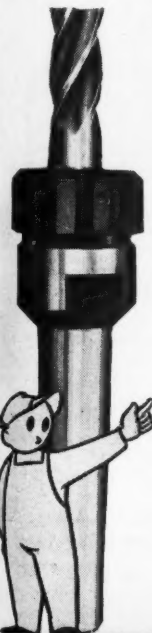
Designed to use a larger diameter bar than formerly used because the chip is cut in front to make room for the bar. This gives you rigidity, higher boring speeds and heavier cuts.

SEND FOR DESCRIPTIVE FOLDER.
Representatives in all principal cities.

EVEREDE TOOL CO.
WILLIS STUTSON
180 N. Wacker Drive Chicago, Ill.

**UNIVERSAL CENTERING
CHUCKS AND STANDARD
CHUCKS STEP UP ACCURACY
—INCREASE SPEED**

Right: Universal Centering Chucks convert a drill press into a centering machine. Furnished with set of bushings and collets for various size center drilling. Accurate and sturdy. Depth adjustment for centers. Write for facts



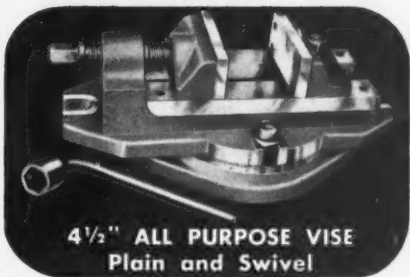
Left: Universal Standard Collet Chucks hold tools in a grip as strong as solid steel itself. Nut for spanner wrench. The ideal tool for holding end mills, keyway cutters, drills, etc. Write for facts.

**UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH, MICH.**

**PRODUCTO
Screw-Acting and Cam-Lock
VISES**



6" HEAVY DUTY VISE
Plain and Swivel



4 1/2" ALL PURPOSE VISE
Plain and Swivel

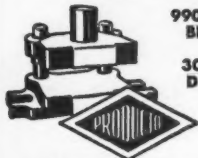


CAM LOCK VISE
4" - 5" - 7" Sizes

THE PRODUCTO MACHINE CO.

990 HOUSATONIC AVE.
BRIDGEPORT, CONN.

3017 MEDBURY AVE.
DETROIT, MICHIGAN



Manufacturers and
Distributors of

Producto Die Sets, Die Makers' Accessories,
Dickerman Automatic Press Feeds.

pleted. The Model 600 pump with its $\frac{1}{4}$ h.p. N.E.M.A. motor is designed to handle up to 10 spindles or cutting tools, providing a flow of coolant which can be regulated from a single drop to a steady stream of 1,200 gallons per hour.

Square D Class 9007 Type P Precision Limit Switches

Designated as the Class 9007 Type P, a line of small precision limit switches specifically designed for use where space

and operating force are limited on modern machine tools or as built-in contact mechanisms on various electrical de-



DANLY DIE SPRINGS

MEDIUM
PRESSURE
HIGH
DEFLECTION

HIGH
PRESSURE
MEDIUM
DEFLECTION



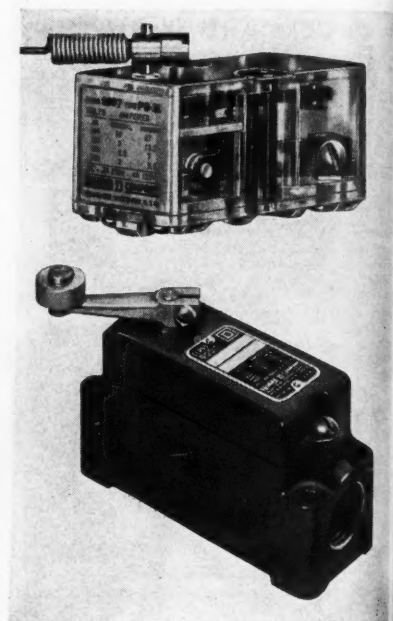
**A COMPLETE LINE TO FILL EVERY
DIE MAKING SPECIFICATION**

DANLY MACHINE SPECIALTIES, INC.
2122 South 52nd Avenue, Chicago, Illinois
Milwaukee, Wis.; Long Island City, N. Y.;
Dayton, Ohio; Detroit, Mich.; Rochester, N. Y.;
Cleveland, Ohio; Philadelphia, Pa.

DANLY PRECISION

**DUCOMMUN METALS
& SUPPLY COMPANY**
Los Angeles, Cal.; San
Francisco, Cal.

**DIE SETS AND DIE
MAKERS' SUPPLIES**

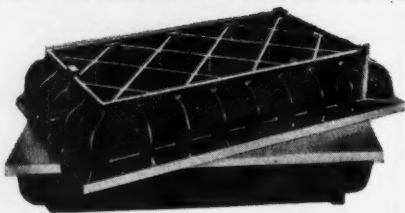


Square D Class 9007 Type P Precision Limit Switches

vices is now being manufactured by the Industrial Controller Division, Square D Company, 4041 N. Richards St., Milwaukee, Wisconsin.

Basic switch units are enclosed in a transparent molded Polystyrene case 1 1/2 inches long x 1 inch square, which is sealed against tampering yet is designed

REID MASTER PLATES



A NECESSITY IN EVERY PLANT WHERE ACCURACY IS DESIRED

THOROUGHLY NORMALIZED AND WEATHER SEASONED.

PLANED and SCRAPED on same 3-POINT BEARING on which they will rest in use. GUARANTEED ACCURACY within .0003" on a 24" x 36" size. PLANED and SCRAPED in sizes 12" x 18" to 36" x 72". THE ONLY PLATE that has a 50% trade in value when purchasing a new REID plate.

Prompt delivery on priority orders.

Tool Engineering Service Co., Inc.
241 Washington Ave. Nutley, N. J.

THE INSPECTOGRAPH

- For Accurate Toolroom Jobs
- For Tool Sharpening
- For Inspection
- For Precision Operations on Small Work



Use the Inspectograph to eliminate shadows and glare, to get higher accuracy on all types of fine work . . . for easier, faster inspection of small finished parts, for tool sharpening, for dozens of similar jobs!

Equipped with a 4" lens for rapid use, the Inspectograph has a soft, diffused fluorescent light inclosed in a conveniently shaped mounting. Shadows and glare are entirely eliminated no matter what shop lighting conditions are.

DIMENSIONS

11½" wide, 12" high, 10" deep, completely equipped, ready for instant use.

PROMPT DELIVERY!

SCHULTZ & ANDERSON CO. MACHINE TOOLS

109 EDISON PLACE

NEWARK, N. J.

MAC-IT

QUALITY STEEL SCREWS

Mac-it hollow set screws stand severe usage without rounding or splitting the socket because:

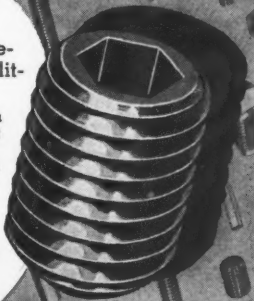
1. Mac-it cuts each angle of the hexagon socket to insure positive key engagement from top to bottom.
2. Mac-it heat treatment multiplies strength and increases durability.

That's why Mac-its stand up supremely well in service!

OTHER MAC-IT PRODUCTS INCLUDE:

Socket Head Cap Screws • Hexagon Head Cap Screws • Square Head Set Screws • Stripper Bolts
Hexagon Socket Pipe Plugs

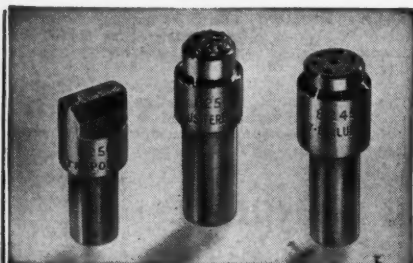
6



THE STRONG CARLISLE & HAMMOND CO., Cleveland, Ohio

to permit visual inspection of contacts. The operating lever of the switch can be adjusted to any position in a complete circle. A 15-deg. travel of the lever is said to be sufficient to operate the switch, the lever being designed to permit an additional 40-deg. emergency over-travel in either direction. A camera shutter type goggles mechanism is said to provide extremely accurate operation with only $2\frac{1}{2}$ ounces of force applied to 1-inch lever arm.

Die-cast enclosures for surface mounting type limit switches are $3\frac{3}{8}$ inches long x $1\frac{1}{8}$ inches wide x $2\frac{3}{4}$ inches



MEYERS "Dia-Brasive" MULTIPLE DIAMOND POINT DRESSERS

For Efficient, Economical Service

With "Dia-Brasive" Multiple Point Dressers, numerous sharp points are always exposed to the work, or face of wheel. New points can be secured by turning dresser a quarter or half turn. The small diamonds are more reasonable in price, and remain sharp longer, than large stones. We also make a complete line of single point diamond dressing tools. Special dressers built to order. Write for new literature.

W. F. MEYERS COMPANY, Inc.
Dept. MS., BEDFORD, IND., U. S. A.

high. A flush type arrangement is also available which permits the switch to be built into machine casting. Either push rod or roller arm actuators are used. Enclosed type switches require a 5-deg. lever rotation for operation and provide for 25-deg. emergency over-travel of operating lever in either direction. A return spring can be readily shifted to reverse contact action or provide latch type operation.

The snap-action silver contacts of switches have both a.c. and d.c. electrical ratings which are said to be high enough for direct control of small solenoids and contactors as large as Square D Size IV. Normally open and normally closed circuits are insulated electrically to make common connection then unnecessary. Four large terminal screws facilitate connections.

Products Engineering Dzus Fastener Driver

The illustration shows a driver for operating Dzus Fasteners which has been announced by the Products Engineering



Products Engineering Dzus Fastener Driver

Co., 700 E. Florence Ave., Los Angeles, Cal. Through a novel arrangement of varying body thicknesses, the driver can be adapted to large, medium, and small Dzus Fasteners.

The body of the tool is of cadmium

5000
Shapes and Sizes

Grobet Swiss Files

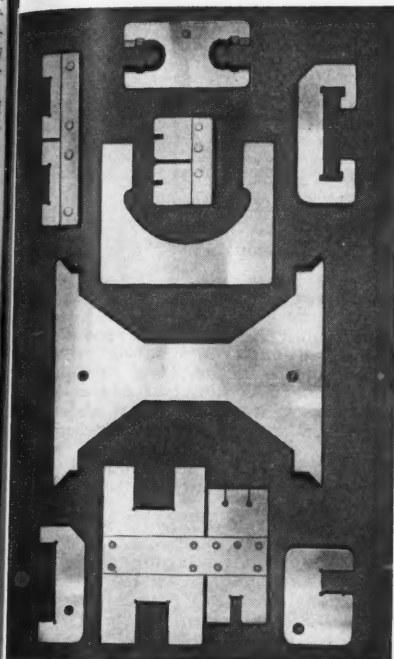


Write
for Catalog KNA

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss files.... Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability. Ask also for catalog KM on Files for Filing Machines; catalog KN on Rotary Files and Diesinkers' Burs.

GROBET FILE CO. of AMERICA • 3 PARK PLACE NEW YORK CITY

SNAP GAGES



Made To Your Specifications.

We also make special plug gages to your specifications.

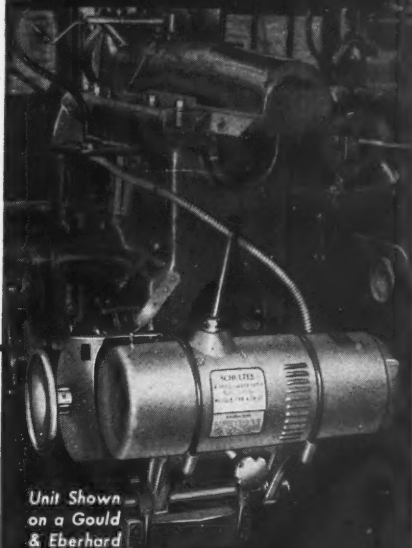
We have no catalog, nor do we carry standard sizes.

**R. KRASBERG & SONS
MFG. CO.**

925 Wrightwood Ave.
Chicago Illinois

"SCHULTES"

*The King of
Motor Drives!*



Unit Shown
on a Gould
& Eberhard

**ALL HELICAL GEARED,
UNSURPASSED IN POWER,
EFFICIENCY, SAFETY AND
COMPACTNESS**

Write for Complete Detailed Specifications

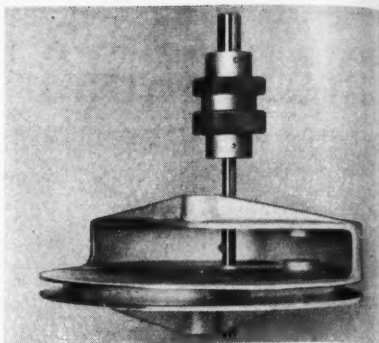
**WESTLOF TOOL
& DIE COMPANY**

4190 BELLEVUE AVE.
DETROIT, MICHIGAN

plated heat-treated chrome-molybdenum steel and the handle is of specially constructed shock-resisting plastic.

Nobur Burring Tool

A burring tool which is said to be particularly useful in removing burrs from the inside edges of multi-walled parts is announced by the Nobur Mfg. Co., 6156 Santa Monica Blvd., Hollywood, Cal. According to the manufacturer, the tool is simple in construction and operation and can be used in a

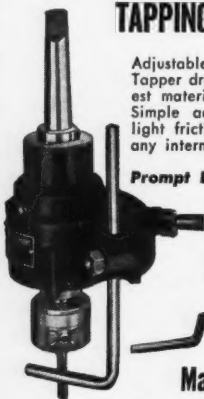


Nobur Burring Tool

Convert Your Drill Press to Tapper in 2 Minutes

with

DORMAN CLUTCH TYPE TAPPING ATTACHMENTS



Adjustable Friction Drive No. 1 Tapper drives smallest tap in softest material to $\frac{3}{8}$ " tap in steel. Simple adjustment changes from light friction to positive drive or any intermediate stage.

Prompt Delivery on All Sizes

No. 2 Tapper Drives from $\frac{1}{4}$ " to $\frac{3}{4}$ ". No. 3 Tapper Drives from $\frac{1}{2}$ " to 1" in steel or other material.

Write for details.

**Dorman
Machine Tool Works**

357 Canal St., New York, N. Y.

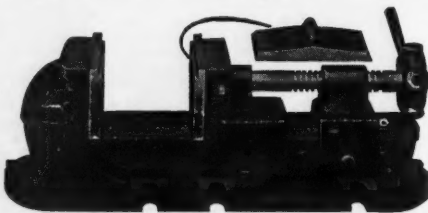
drill press, lathe, or other machine spindle.

The Nobur Burring Tool consists of a cylindrical shaft which serves as a pilot in the hole to be deburred. To one end of this shaft is fastened a free-rolling ball bearing knurled collar which can be grasped and held by the hand even while the shaft is rotating. By sliding the collar up or down, the burring blade may be advanced into cutting position or withdrawn.

The burring blade is of special tool steel and can be easily and quickly removed for resharpening and, when completely worn down, can be readily replaced. All essential parts of the burring tool are case hardened and ground.

The Nobur Burring Tool is available in $\frac{1}{8}$ -inch progressive sizes from $\frac{1}{8}$ to 1 inch. Additional sizes and special tools can be furnished on order. The Nobur Burring Tool can be obtained singly or in sets of five. Single tools are supplied packed in a sliding top wooden box, and sets of tools are furnished in stained and lacquered wooden boxes with hinged cover.

GEM DRILL PRESS AND MACHINE VISES . . .



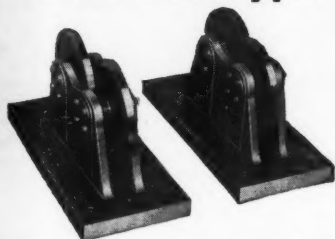
Modern Vises for Tool-room and Production. Sizes ranging from 3" to 10 $\frac{1}{2}$ " opening. Strong, Versatile, Quick-Acting. Pay for themselves in time-saving.

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A sub base can be made of proper height to give necessary clearance for large diameter work. Supersensitive ball bearings and hardened and ground spindles assure accuracy.

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Where thousands of tapped
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Clinometer

Clinometer

An instrument for checking with greatest accuracy inclinations toward the true horizontal or vertical, to be known as the Clinometer, has been introduced by the Acme Tool Co., 203 Church St., New York, N. Y. Uses of the instrument include testing inclined surfaces of airplane wings, testing the pitch angles of propeller blades, setting up of arbors on machine tools such as milling machines, gear hobbors, and so on, setting up of work on machine tool tables, testing and setting up of machine tools, and so on. According to the manufacturer, the rotor of the Clinometer is accurately tested to repeat to

a limit of $7\frac{1}{2}$ seconds.

The Clinometer is an instrument of the pendulum type, the pendulum being formed by a drum accurately engraved in degrees from 0 to 180. The center of gravity of the drum is said to be low and its mounting frictionless. A thumb-screw acting against a large star spring serves as a damper for the pendulum as well as a means for locking the pendulum after it has ceased swinging, thus enabling instrument to be safely removed from surface to which it is applied for more easy and accurate reading. According to the manufacturer, the drum or pendulum has such a low periodicity that it is not readily affected by ordinary vibrations occurring in the shop.

Designed for reading to an accuracy of one minute of an arc by semi-skilled operators, the Clinometer is of lightweight construction and is made to withstand hard usage. Several different models of the instrument for various operations are available.



STRAIGHT SIDE PRESSES

Outstanding in every detail for heavy blanking and forming work.

All stresses are taken centrally.

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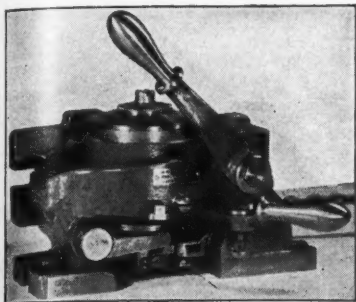
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quicker
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better?

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Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

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VICTOR HAND HACK SAW BLADES STANDARD RECOMMENDATIONS

MATERIAL	TYPE BLADE	TEETH IN.
Aluminum	"Moly" All Hard	14
Brass	"Moly" All Hard	14
Conduit	"Moly" Flex. or Spec. Flex.	24
Copper	"Moly" All Hard	14
Drill Rod	"Moly" All Hard	24
Hard Alloys	"Moly"	18
Light Angles	"Moly" All Hard	18
Metal Trim	"Moly" Flex. or Spec. Flex.	24
Pipe Tubing	"Moly" Flex. or Spec. Flex.	24
Sheet Metals	"Moly" All Hard	18
Soft Steel	"Moly" All Hard	14
Steel Pipe	"Moly"	24
Thin Tubing	"Moly" Flex. or Spec. Flex.	32
Thin Wall Metals	"Moly" Flex. or Spec. Flex.	32
Tool Steel	"Moly" All Hard	18

Power Blade Recommendations, hand saw recommendations and plenty of helpful tips on choosing and using blades and frames are in this free booklet. Use coupon to get your free copy now!

VICTOR HIGH SPEED
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Please send immediately my copy of
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2621

MODERN MACHINE SHOP 301

Federal Model 167 P-75 Inside Diameter Gage

Illustrated herewith is the Model 167 P-75 inside diameter gage for checking shallow holes and recesses up to 6.80 inches in diameter which is now being marketed by Federal Products Corp., 1144 Eddy St. Providence, Rhode Island.

The indicator of the gage is graduated in ten-thousandths of an inch and has a range of 0.025 inch. The indicator is located back away from contacts so as to clear obstructions on machine. Motion of the sensitive contact is trans-



Federal Model 167 P-75 Inside Diameter Gage

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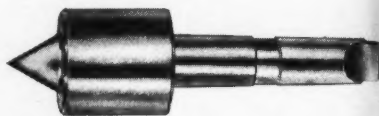
Gear Specialties

MANUFACTURERS
CHICAGO

mitted to the indicator through a spring hinge, thus eliminating all lost motion as well as friction.

"Quadro" Precision Live Center

A precision live center to be known as the "Quadro" is now being marketed by the Fisher Tool Co., 226 Lafayette



"Quadro" Precision Live Center

St., New York, N. Y. Features of the center include four rows of precision BEC-4 specification bearings, short overhang to assure rigidity and accu-

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FOR ALL WET GRINDING OPERATIONS

A CONCENTRATE—Immediately Miscible with your present Grinding Fluid.
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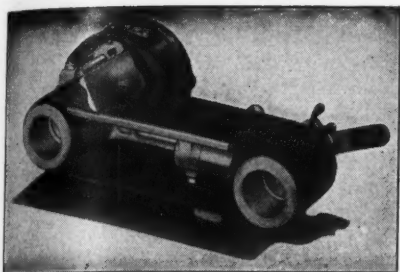
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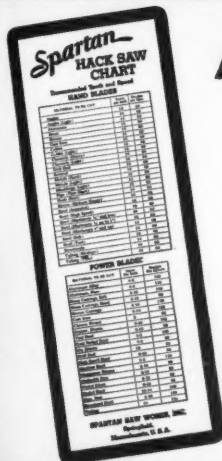
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racy and eliminate chatter, positive felt-seal designed to exclude dirt and retain lubrication, and hardened and ground cone with point accurate to 0.0002 inch.

The Quadro Precision Live Center is available in four sizes with Morse taper No. 2, 3, 4, and 5.

Reading Keyseater No. 1

Shown here is the Reading Keyseater No. 1, which is now being marketed by the Reading Machine Co., Reading,

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ECONOMY**

The HAMILTON
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Super Sensitive
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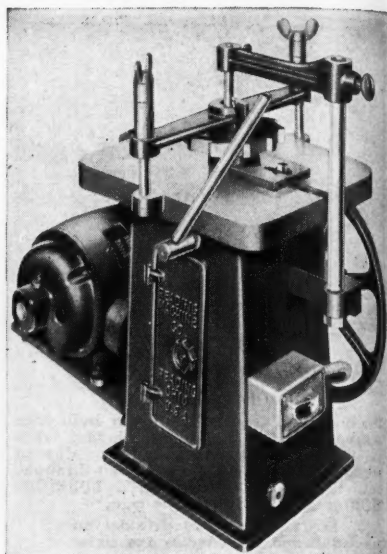


for drilling small holes
.004" to .250" diameter

Unexcelled on instru-
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The Hamilton Tool Co.



Reading Keyseater No. 1

Ohio. The broach-type cutter of the machine is said to be ideally suited for cutting keyways in small collars, spacers, gears, pulleys, ratchets, handwheels, flywheels, and so on. The machine is designed to cut straight or taper keyways up to a length of 4 inches and is said to be equally suitable for use on tool steel, cast iron, bronze, brass, cold rolled steel, copper, aluminum, and other metals. The unit is also adaptable for slotting, filing, sawing, shaping, and so on.

Designed for easy operation by inexperienced workmen, the Reading Keyseater No. 1 is provided with a convenient clamp arm for use in holding down

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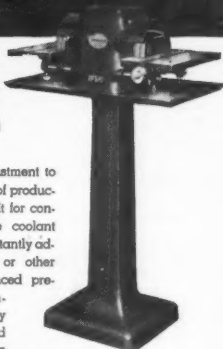
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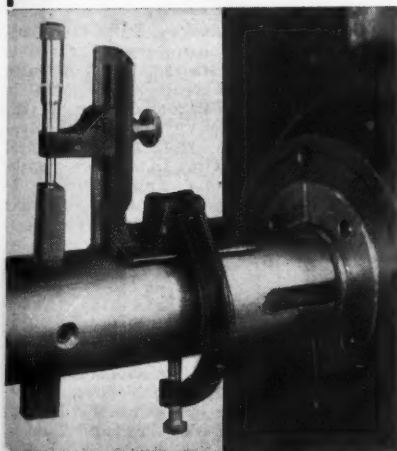


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SPEED and ACCURACY essentials in WAR PRODUCTION SHOPS

Clamp the Tool Setting Gauge to the boring bar. Use the slide to bring micrometer to top of cutter. Back off micrometer to number of thousandths required to bore to size, adjust cutter to micrometer and fasten it, remove gauge and go to work.

The gauge may be had with either a micrometer or dial indicator.

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round, square, or irregularly shaped workpieces. The machine is readily portable and has few moving parts, thus making for long life.

The Reading Keyseater No. 1 is provided with a 4-inch stroke and is designed to accommodate work up to 12 inches in diameter. The machine has a minimum height of 25 inches and a maximum height of 28 inches, and occupies a floor space of 16½ x 29 inches. The unit is designed for operation by means of a ¾ h.p. motor (1,150 r.p.m. recommended) through a V-belt drive, and is equipped with an adjustable motor bracket.

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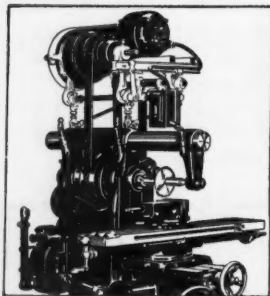


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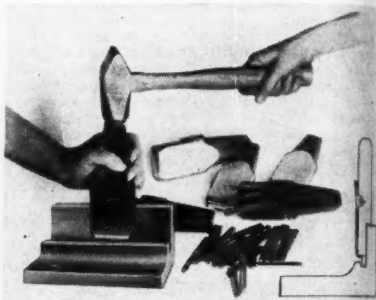
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Designed for use in stamping numbers and letters into inaccessible places on castings, forgings, and machine



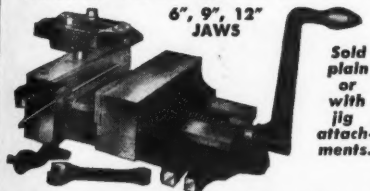
Acromark Special "Hercules" Type Holder

parts of steel, cast iron, bronze, and other metals or materials, a specially constructed "Hercules" Type Holder together with type is now being offered by The Acromark Corp., 9 Morrell St., Elizabeth, N. J. The holder is made of a special alloy tool steel of unusual hardness, strength, and resistance to shock. It is tapered to fit the hand and brought to a head for easy striking at a central point.

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JAWS



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plain
or
with
jig
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Request illustrated price circulars

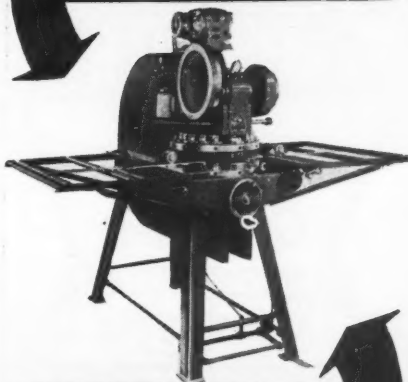
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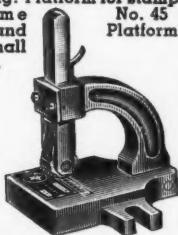
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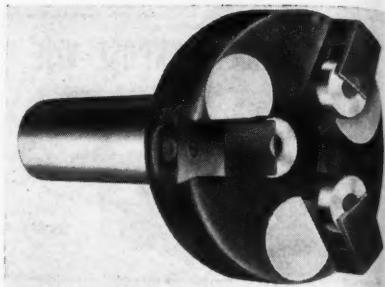
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1821 SEDGLEY AVENUE, PHILADELPHIA, PA.

designed so as to extend to the limits permitted by the marking position. A spring pressure clip holds the type firmly in position, the type being readily interchanged by simple pressure on the holding clip.

Boyar-Schultz Model "C" Burnishing Tool

Designated as the Model "C," a burnishing tool for automatic screw machines has been placed on the market



Boyar-Schultz Model "C" Burnishing Tool

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Machined Steel Semi-Steel

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The Boyar-Schultz Model "C" Burnishing Tool is of simple, sturdy construction and can be quickly and easily adjusted for efficient operation. The tool is available in three sizes.

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In answer to requests from aircraft manufacturers for a quick, firm, and trouble-free means for attaching cowlings and other removable parts, the Aviation Division of Shakeproof Inc., 2501 N. Keeler Ave., Chicago, Ill., has introduced an efficient cowl fastener of the type shown herewith. The fastener consists of three parts—main spring, stud, and cross pin—and requires only two special tools for application.

To install, the main spring is riveted in place over a drilled or punched clearance hole in the inner surface sheet and the stud member inserted in a matching

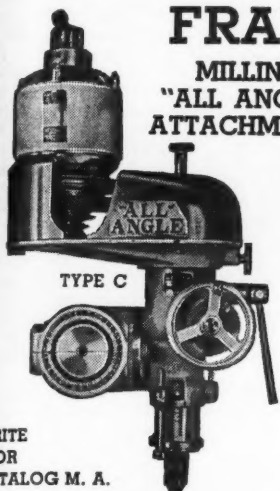


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THOR STAMPS give clear, uniform marks that will last indefinitely. And they'll give you more marks per dollar, too! THOR STAMPS are made of correctly-heated alloy steel with thumb side marking to make them easy to read—easy to use.

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"ALL ANGLE"
ATTACHMENTS

TYPE C

WRITE
FOR
CATALOG M. A.

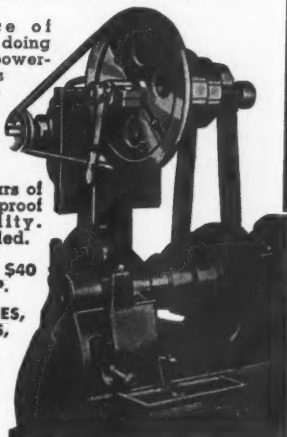
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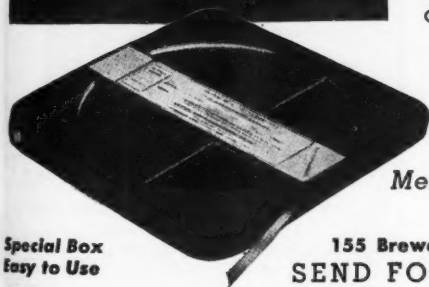
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Atlantic Metal Cutting Band Saw Blades have been developed through twenty years of research and specialization.



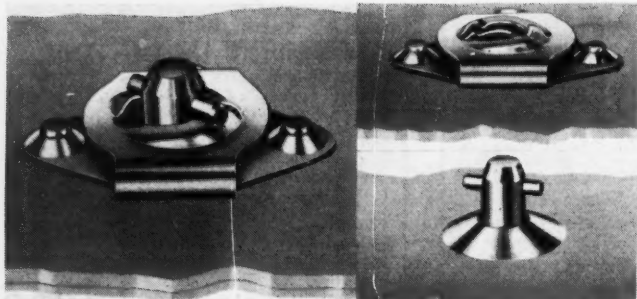
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**Special Box
easy to Use**



(Left) Shakeproof Cowl Fastener Assembly in Locked Position. (Right) Shakeproof Cowl Fastener Assembly in Unlocked Position—Two Sheets Separated

clearance hole in the outer sheet. The cross pin is then press-fitted into the stud with special pliers. Upon closure of the cowl or removable part, the stud member and main spring quickly move into alignment. A clockwise quarter turn locks the stud and pulls the parts together with a powerful dual spring tension. The stud is automatically stopped in position by scientifically designed detents in the cams of

compact in size, light in weight, and has provision for the addition, without special tooling, of optional accessories such as corrosion insulators, right angle mounting brackets, and stud ejector springs. Special adapters can be supplied to permit installation where parts have already been tooled for grommet type fasteners.

In addition to cowls, the Shakeproof Cowl Fastener can be used for attach-

the main spring.

According to the manufacturer, the Shakeproof Cowl Fastener reinforces rather than weakens the adjacent structural area, presents no stress hazards, provides limited deflection with high initial axial tension, compensates for the usual variation in commercial aluminum sheet thicknesses, and will not bind when used on curved surfaces. It is



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A simplified, precision tool for milling, boring, facing and routing small parts for instruments, arms and munitions in tool, die and machine shops.

Spindle dia. at driving end, $\frac{1}{2}$ ". 1150 and 1750 r.p.m., 5 speeds. 12" longitudinal travel of table, 7" cross travel. 4" spindle feed.

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AUTOM



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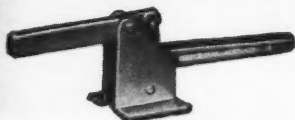
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Extra Strong—Longer Life

Products Engineering Company's quick acting jig clamps are the only drop forged clamps available—they're stronger—have exceptional opening and closing speed and a positive lock impervious to pressure and vibrations—it pays to specify them. Available in many models and sizes from midget to 6" clamping bars. Send today for file size catalog.

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BURKE MILLING MACHINES



**No. 4 Motor Driven MILLING MACHINE
Mounted on Cabinet Column**

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

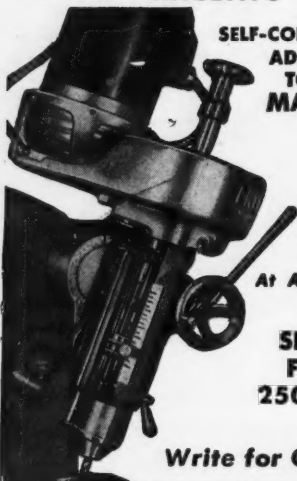
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BURKE MACHINE TOOL CO.

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**SELF-CONTAINED.
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**Mills
Drills
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At Any Angle**

**SPEEDS
FROM
250-4000**

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High Carbon and High Speed Steel.
All sizes—all shapes. Write for catalog.



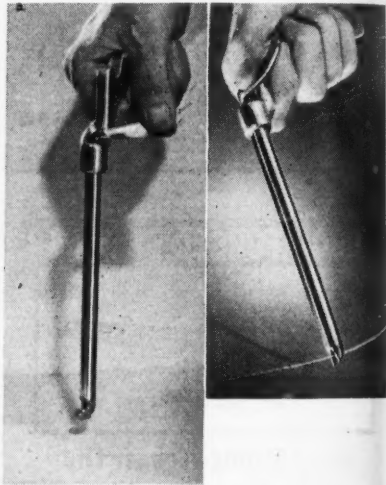
STRATFORD

CONN.

ing fairing surfaces, wing inspection plates, door fastenings, terminal box covers, radio equipment covers, landing gear covers, battery compartment box lids, ammunition and machine gun bay covers, flooring, and instrument panels. The fastener is manufactured in two sizes to conform to AN strength classifications 5 and 7 and can be obtained with flush, oval, and wing head studs. Standard units are available to accommodate material thicknesses ranging from 0.035 to 0.254 inch.

Alpert Long-Nose Cutter-Retriever

Designed for one-hand one-finger trigger operation, the Alpert Long-Nose Cutter-Retriever illustrated herewith.



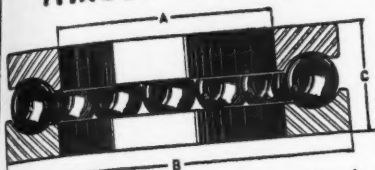
Alpert Long-Nose Cutter-Retriever

product of the Pack-Rite Machine Corp., 828 N. Broadway, Milwaukee, Wis., can be readily used for cutting wire or retrieving or holding, in a powerful grip, nuts, bolts, washers, cotter pins, and so on, in inaccessible places. As shown in the illustration, the unit resembles a pistol, the cutting edges being located at the end of the long slim barrel.

To cut wire, the operator merely places the wire between the cutting edges at the "business end" of the pistol and snips off the wire by pressing down the trigger, which actuates a rod

G WILLIAM

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Type CC—Designed to Take Combined THRUST and LIGHT RADIAL LOADS

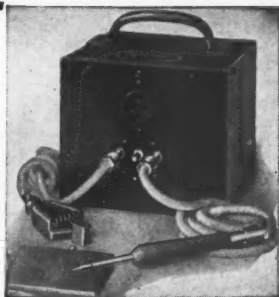
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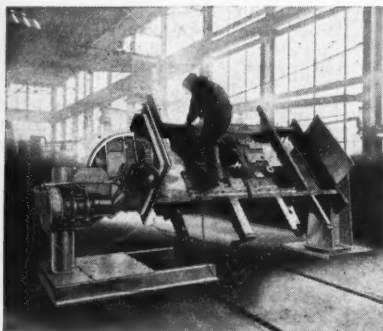
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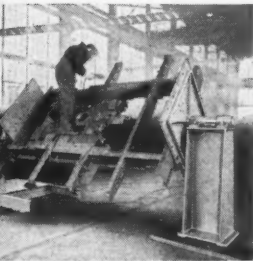


- Our NEW booklet WP 21 is just off the press giving full information about C-F Positioners in four sizes from 1200 to 14,000 lbs., capacity. Write for it.



C-F POSITIONER

A



B

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operating inside the barrel of the pistol. The leverage ratio is 15 to 1, hence a negligible amount of thumb pressure is required to operate the trigger. To retrieve a bolt, nut, washer, cotter pin, and so on, which may have dropped into an inaccessible place, the long-nose barrel is merely poked into the hard-to-get-at place and the trigger pressed down, thus actuating the hardened steel cutters at the end of the barrel to readily pick up the part desired.

The Alpert Long-Nose Cutter-Retriever is light in weight and can be easily slipped into a belt or holster.

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Automatic and Hand
THE TAYLOR MACHINE CO.**

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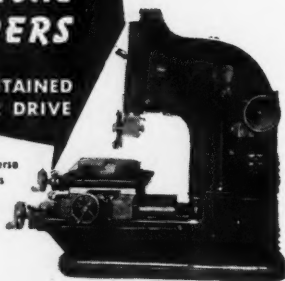
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power rapid transverse
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Timken Tapered
Roller Bearings for
Main Spindle—all
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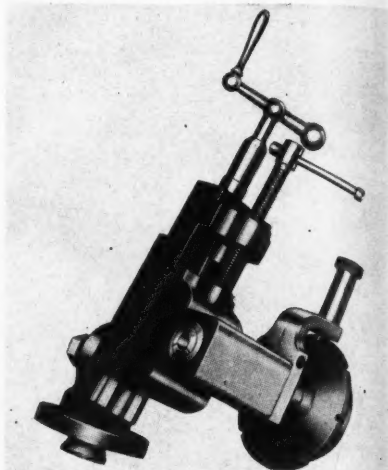
Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

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Thompson Universal Milling Fixture

Specially designed for use on any standard bench lathe, thereby converting this type of lathe into an economi-



Thompson Universal Milling Fixture

cal, time-saving milling machine, a universal milling fixture with three-way circular swing, designated as the Thompson, is announced by the Auto-Ordinance Corp., 1437 Railroad Ave., Bridgeport, Connecticut.

The fixture is said to provide a wide variety of applications, being efficiently used for milling punches, end mills, keyways, counterbores, and so on, or the manufacture of duplicate parts. For straight or angular milling, the vise and universal slide base can be used without index fixture.

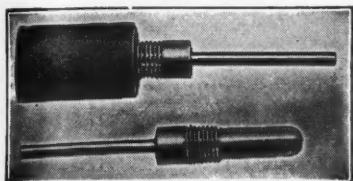
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20" long x 12" wide x 6 1/2" deep.
16 ga., drag holes and handles both ends.

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Field Abrasive Specialty Mfg. Co.
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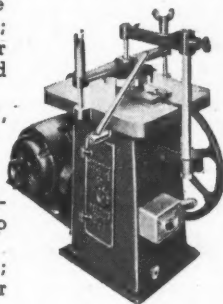
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Portable—move directly to job; a time saver for both small and large shops.

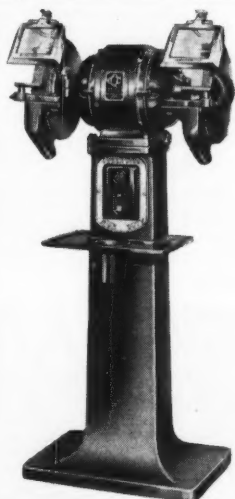
Any round, square, or irregular shaped part easily held down by convenient clamp arm.

4" stroke; adaptable for other work.

Low first cost — prompt delivery.
Good dealers wanted.



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**Dependable • Efficient
Economical**

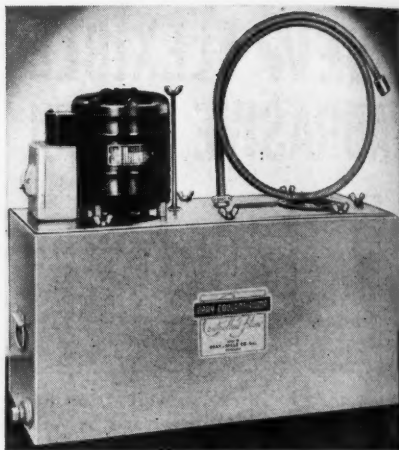
Consider these facts when buying a grinder—Queen City Grinders are equipped with fully enclosed motors to protect from dust and grit. On the heavier machines, motors of 1750 R.P.M. are used which do not require large diameter wheels in order to secure the proper cutting speed at the periphery of the wheel. All grinders are equipped with carborundum wheels at no extra price. And for economy—you can't beat it. Try one of these grinders for 30 days. If you are not satisfied, return it. We can make reasonable delivery.

QUEEN CITY MACHINE TOOL COMPANY
217 EAST SECOND ST. CINCINNATI, OHIO

Gray Heavy Duty "A" Series Portable Coolant Pumps

Three large capacity coolant pumps for automatic application of coolants to cutting tools of heavy duty machine tools are announced by the Gray-Mills Co., Inc., 217 W. Ontario St., Chicago, Ill. Designated as Heavy Duty "A" series pumps G-2A, G-3A, and G-4A, the units are designed to prolong tool life, speed up production, provide more efficient operation, and so on.

Features of the Gray Heavy Duty "A" Series Coolant Pumps include complete



Gray Heavy Duty "A" Series Portable
Coolant Pump G-4A

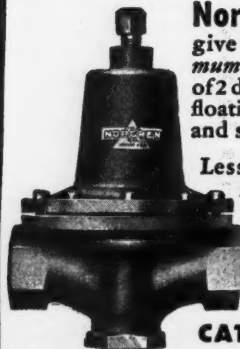
portability, controlled flow of coolant from a few drops to full stream, baffle plate construction and forced settling fixture for keeping coolant fluids clean at all times, large tank capacity (10 and 12½ gal.), ball bearing type motor having easily replaced driving gears hardened for long life, clean-out plug for quick and easy tank cleaning, flexible power shaft coupling, and easy access to all working parts.

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Also special saws.
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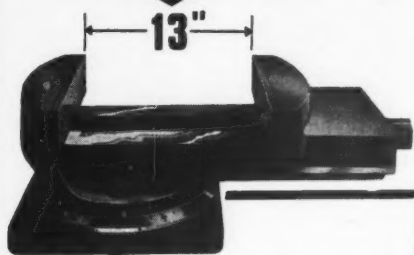
Write for Specification Sheets and Prices . . .

COLONIAL BUSHINGS, Inc.
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COLONIAL

DRILL JIG BUSHINGS

A BIG VISE FOR YOUR BIG JOBS



. . . and Precision, too!

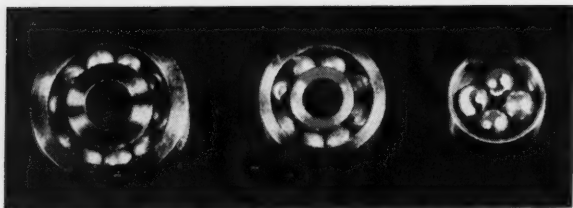
It's new—larger—heavier—accurate! Designed and built to fill the need for precision on the big vise jobs. Note the heavy jaws, longer ways, broad base and extra swivel bearing surface of this Rouselle Victory Vise. Once swivel is set, it stays put! Built to cut set-up time in half—made in three sizes: 7 in., 10 in. and 13 in.

Write for Bulletin MM72 and prices.

Preference rating certificate must accompany orders.

Distributors: A few select territories still available.

DAVID J. ROSS CO.
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"Miniature" Nonmagnetic Bearings

por or other mild corrosives, and so on, is now being offered by Miniature Precision Bearings, Keene, N. H. The series includes No. 4 and No. 5 radial bearings and No. 3P pivot bearings.

The nonmagnetic bearings have races and balls manufactured of Berylco No. 25, a patented beryllium copper alloy which is hardened after machining by heat treatment to approximately 40 Rockwell. All dimensions and tolerances of the bearings are identical with those of the company's standard S.A.E. 52100 chrome steel bearings.

Oil Dermatitis Preventive

The claim is made that industrial dermatitis or skin disorders caused by bac-

terial or fungus infestations in cutting oils, drawing oils, core oils and similar compounds can be prevented by addition of odorless, water soluble germicide in tablet form. The tablets are dissolved at the rate of one tablet per gallon of emulsified oil base or compound. This solution is added to cutting oil base before dilution with

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The product is also claimed to prevent odors and decomposition of oils by preventing or retarding bacterial or fungus growth. Tablets are packed 100 to box. Made by the Natriphene Company, 3337 Book Building, Detroit, Michigan.

Samples of Natriphene products will be mailed on request to plant physicians, sanitary engineers, or purchasing agents. Inquiries for data and information will receive full attention.

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A line of master surface plates made from special fine grain cast steel of con-



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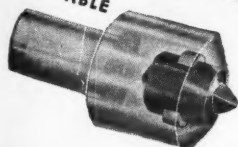
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Because: Wing key
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All diamond sizes 1/4 to 10 karat are nib mounted for immediate shipment... Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, \$1.00 post paid.)

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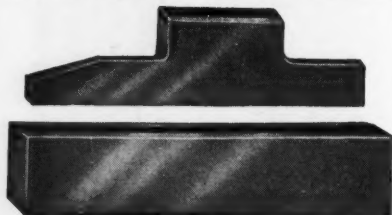
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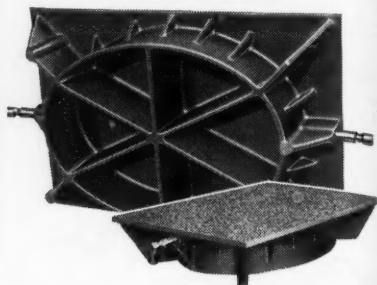


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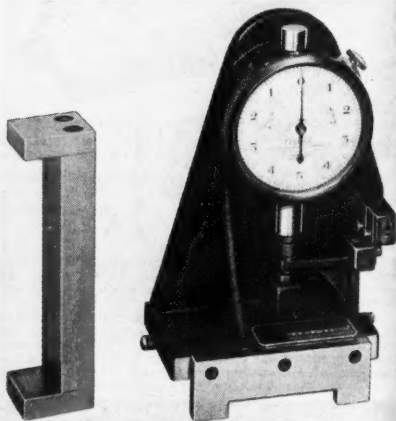


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Federal Model 294 P-26 Gage

The illustration shows a gage for in-
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crankshaft bearings which has been an-
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check is shown at the left of the gage,



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**Remove
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Insert WALTON Tap Ex-
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broken piece. No an-
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Easily

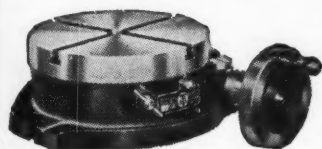
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Wrench are only tools
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Safely

Threads are not dam-
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which is designated as the Model 294 P-26.

The sensitive contact point at the right of the base of the gage is mounted on a triangular piece which is supported on flat springs, thus permitting the triangular piece to transmit the motion of the contact point to the indicator without friction or lost motion. The latter can be controlled by a screw and check nut located below the indicator point.

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Bancroft Automatic Chemical Sprinkler System

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The operation of the Bancroft Chemical Sprinkler System is automatic. By means of a pressure switch controlling the motor, the air compressor of the system maintains a constant pressure on the extinguishing liquid in the tank and pipe line. In the event of a fire, the heat from same melts a fuse link,

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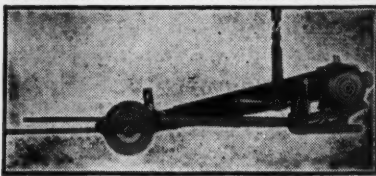


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COOLANT PUMPS—for handling cooling oils on machinery. Complete assemblies and special models designed to be incorporated directly into the machinery. Automatic reversing and pressure releasing types. Capacities up to 50 gpm.

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Forget your pump worries. You can always count on Tuthill's positive displacement internal gear rotary pumps to meet your small pump requirements. Tuthill pumps are known for their dependability, economy and long life as proved by hundreds of thousands in the field. Make Tuthill your source of supply for these outstanding pumps.

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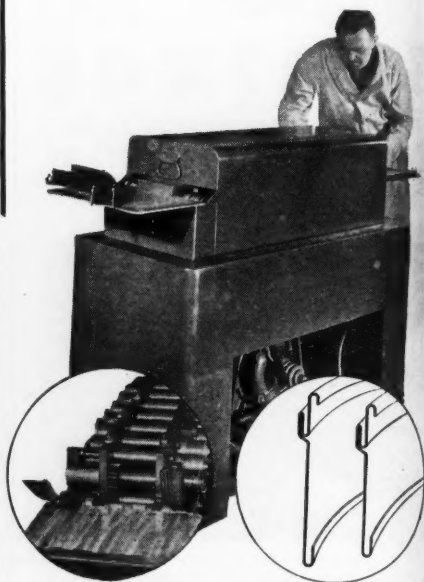
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GROB BROTHERS
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thus causing the sprinkler head to open and thereby permitting the extinguishing liquid, under pressure, to be sprayed out onto the fire. Immediately upon contact with the flame or heat, the extinguishing liquid vaporizes, thereby forming a heavy blanket of vapor which consumes the heat, displaces the air, and stops combustion. Actual tests, it is claimed, have resulted in fires being extinguished in 60 seconds or less.

Lockformer Model S10 Rolling Machine

The Lockformer Co., 4613 Arthington St., Chicago, Ill., has brought out a rolling machine, designated as the Model



Lockformer Model S10 Rolling Machine

S10, which is especially designed for shaping metal strips for use as edges of revolving storage bin trays.

In operation, flat strips of 20 gauge sheet metal are fed into rolls on either side of the forming head of the machine. The strips, in one operation or one pass through the machine, emerge from the forming head in the design shown. Production is said to be at a

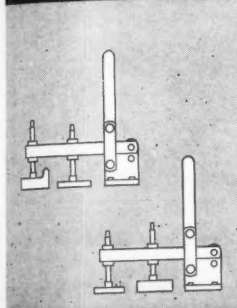
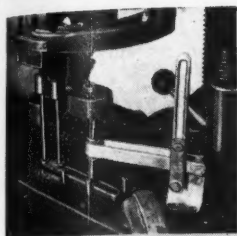
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Simultaneous Clamping

AT MORE THAN ONE POINT

One clamping operation can now hold several pieces at one time regardless of thickness or shape. A new model Knu-Vise Toggle-Action Clamp (No. KV-195) makes this possible. Its U-shaped toggle arm permits the quick insertion and adjustment—horizontally or vertically—of pressure pads at one or more points. The same setup remains uniformly fixed for entire job. Many motions are thus eliminated, and much time is saved. One flip of lever either clamps or releases. Applied pressure ratio is in excess of 40 to 1.

*If you have any clamping operations,
perhaps we can show you some short-
cuts to save time and speed production.*

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July, 1942

MODERN MACHINE SHOP 325

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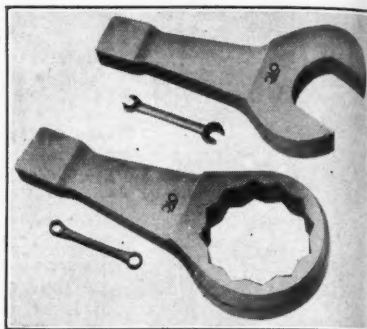
rate of 40 feet per minute or approximately 600 pieces per hour.

Rolls on the right-hand side of the machine produce a finished strip measuring 2½ inches wide, and rolls on the left side produce a strip measuring 2 inches wide. Both strips, in addition to having the shape shown in the illustration, are also given a fixed longitudinal radius.

OTC Maintenance Tools


A line of tools particularly designed for maintenance of machines operating

on 24-hour war production schedule is now being marketed by the Owatonna Tool Co., 357 Cedar St., Owatonna



OTC Maintenance Tools

Minn. Designated as the OTC, the line includes heavy duty pullers, sockets, box wrenches, slugging wrenches, and special tools.



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CHICAGO ILLINOIS

"Truck-Man"

A specially designed motorized truck for moving materials through factories, and so on, to be known as the "Truck-Man," is now being offered by Yard-Man, Inc., Jackson, Mich. The truck, which has a capacity of 2,000 lb., is of simple design and is said to be unusually economical to operate. Grease-sealed ball bearings are used on all rotating shafts, thus eliminating lubrication at these points. The Hyatt roller bearings in the load wheels are said to require a minimum of lubrication.

According to the manufacturer, the Truck-Man is designed for ready oper-



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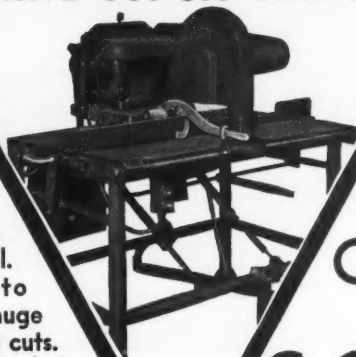
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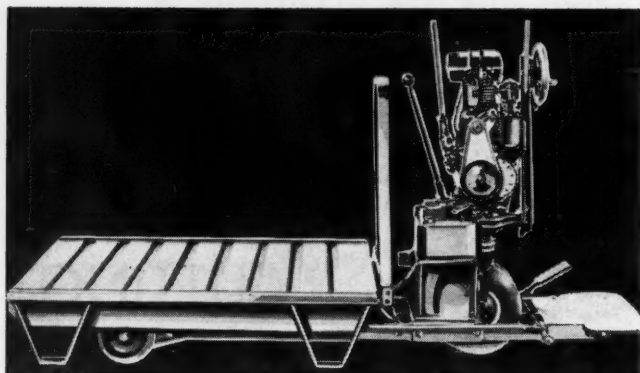
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for Taps and Reamers...

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"Truck-Man"

elevating platform which is 54 inches long, 27 inches wide, and has a lift of $3\frac{3}{4}$ inches. The truck is also provided with two brakes on load wheels which are controlled by foot pedal near operator's platform. Total weight of truck, 800 pounds.

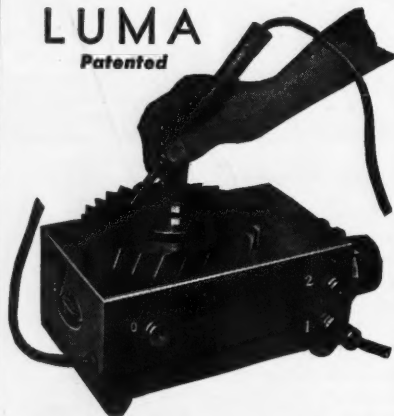
ation by unskilled operators and can be easily and quickly reversed by rotating the power unit 180 deg. The truck is said to operate with equal ease in either direction, the speeds both forward and reverse being the same (4 m.p.h.). The motor of the truck is a $1\frac{1}{2}$ h.p. air-cooled unit, which can be readily removed for repair by unfastening four bolts.

The Truck-Man is equipped with an

G-E Type W-26 All-Position High-Quality A.C. Arc Welding Electrode

Designated as the Type W-26, an all-position alternating current electrode designed to extend the advantages of high-quality a.c. welding to both vertical and overhead welding operations has been announced by the General Electric

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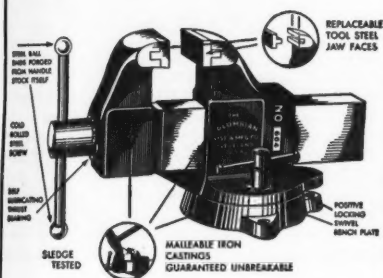
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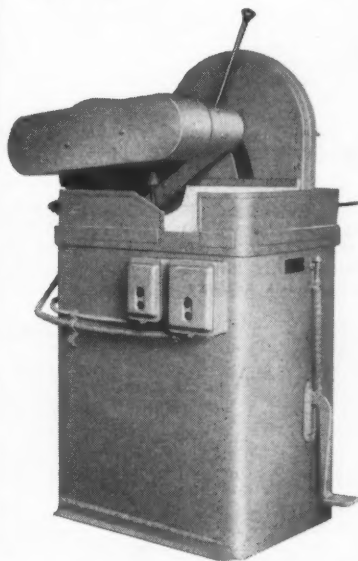
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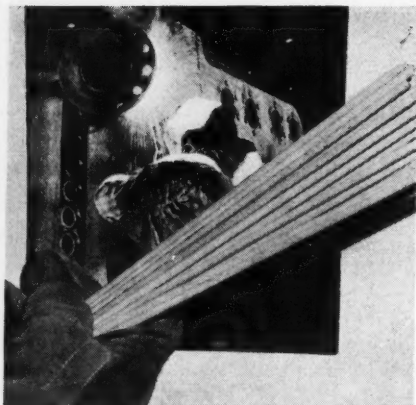


These CATSKILL Abrasive Cut-Off Machines are cutting gear blanks, unannealed stock, tubing, extruded bars, cylinders, high carbon steel, pipe, etc.—without a secondary finishing operation. Solids to 2" and tubing and shapes to 3".

Cutting wheel runs in a slotted pipe through which coolant is pumped. This prevents surface hardening, burn and burr, and insures a smooth finished cut.

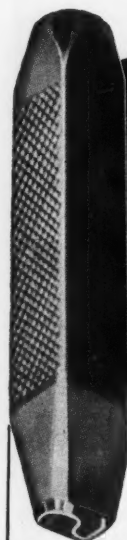
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Manufacturing Engineers
CATSKILL NEW YORK



G-E Type W-26 All-Position High-Quality A.C. Arc Welding Electrodes. Welder in background is shown making overhead weld using G-E Type W-26 electrode

Co., Schenectady, N. Y. The electrode is said to comply with the requirements of the following specifications: A.W.S. Filler Metal Specification E6011; Navy Bureau of Ships Specification 46E3,



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CCA Filter

Filters, Inc., 1515 Gardena Ave., Glendale, Cal., announces the addition to its line of filters of a two-outlet and three-outlet filter for serving two or three air tool operations at one point. The filters, which are designated as CCA (Conditioned Compressed Air) Filters, are designed to prevent harmful dust, rust, scale, oil, and water from getting into air tools, thus prolonging the life and efficiency of the tools.

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See illustration at right. The straightness of the bands formed by
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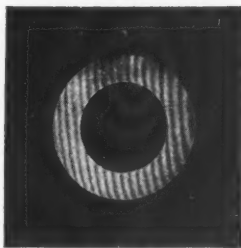
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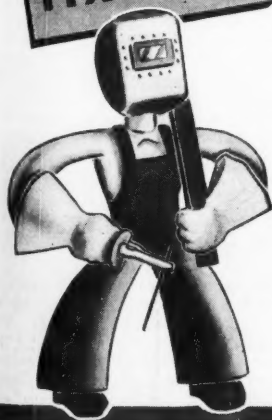
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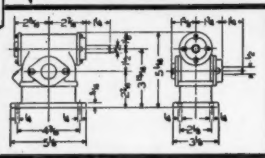
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According to the manufacturer, a valuable use of the CCA Filter is in reducing the number of rejects of precision machined parts, which can become damaged by the sandblasting effect of dust and moisture in the air jets used to clean them. Centrifugal action of the air within the filter is said to remove 90 per cent of the dirt and moisture, the balance being filtered out.

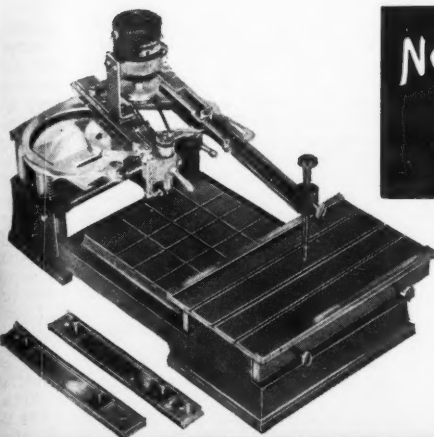


CCA Filter

by a special wool-felt glove. To clean the water and dirt are blown out of the drain valve at the bottom of the bowl, and the filter may be completely dismantled without disconnecting from the line.

Bristol "Pyrovac" Radiation Pyrometer

A radiation pyrometer to be known as the "Pyrovac" has been developed by The Bristol Co., Waterbury, Conn. The pyrometer is designed for recording, indicating, or automatically controlling temperatures in furnaces and kilns above 900 deg. F. The temperature-sensitive unit or radiation head is



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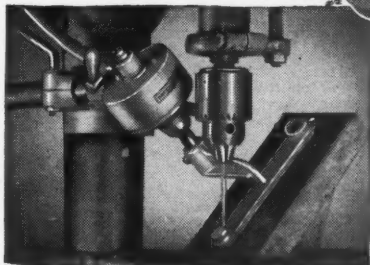
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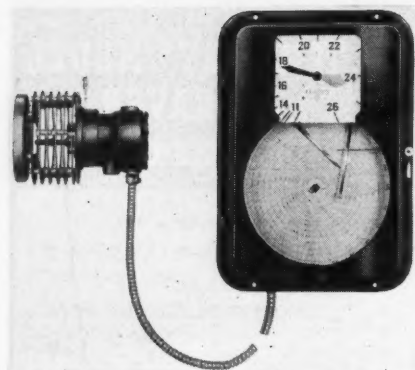
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Mead Specialties Co.

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CHICAGO



Bristol "Pyrovac" Radiation Pyrometer

mounted on the outside of the furnace out of the hot zone where it picks up heat rays emitted from the object under measurement, thus registering its surface temperature.

According to the manufacturers, the Pyrovac Radiation Pyrometer is intended for use in measuring and automatically controlling temperatures which

fall into the following classifications: (1) high temperatures out of the range of thermocouple, (2) temperatures for which rare-metal thermocouples are used, (3) surface temperatures such as roof, wall, duct, lining, or retort temperatures and the temperature of the work itself rather than furnace or kiln temperature surrounding the work, and (4) temperatures where object is moving, inaccessible, or where there are space limitations.

New Books

Machine Tools at Work. By Charles O. Herb. Published by The Industrial Press, 148 Lafayette St., New York, N. Y. 544 pages, 6 x 9 inches. 434 illustrations. Cloth binding, board covers. Price, \$4.00.

This book, as its title indicates, deals throughout with machine tools in action and shows actual examples of shop practice. These examples have been carefully selected from some of the best equipped shops in the United States to illustrate a wide range of applications of modern machine tools. The 434 illus-

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trations showing outstanding jobs from all types of machine-building plants constitute what is believed to be one of the most unusual series of shop practice photographs ever assembled in one volume. These illustrations represent jobs on a large variety of the most modern types of machine tools such as are used for turning, drilling, milling, planing, grinding, broaching, and so on.

All operations of the same general character are grouped together, thus showing a wide range of applications for each type of machine tool included. For example, one chapter contains un-

only the actual machining operations but the tooling, work-holding, and other auxiliary equipment. These views are all accompanied by the main facts about each job.

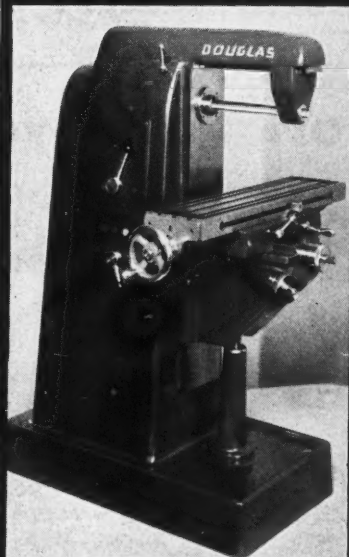
Milling-Machine Indexing. By C. A. Felker and H. W. Paine. Published by The Bruce Publishing Co., Milwaukee, Wis. 88 pages. Cloth binding, board covers.

In this book, the authors have attempted to give the matter of milling-

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machine indexing an unusually thorough treatment. Discussed are the five accepted types of indexing—direct, simple, differential, block, and compound—with explanations and sample problems included showing the best fields of application for each type of procedure. In addition to the mathematical procedure involved, sufficient trade information is presented concerning indexing attachments in common use so that the operation and construction of the various available types can be easily understood.

Instructional material is so arranged



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Cleveland, Ohio

that the book may be used either as a machinists' reference book or as a classroom text for the upper grades of vocational or technical high schools, or for apprentice and employee training classes, or for college engineering machine shop classes. This versatility of application has been obtained by first presenting necessary trade information concerning indexing attachments and the setup being studied, in each of the six chapters. This is followed by explanations and sample problems regarding the different applications. To meet the needs of vocational and related-subject classrooms, additional problems are presented for solution under the heading Assigned Problems.

Shop Theory. Prepared by the Shop Theory Department of the Henry Ford Trade School, Dearborn, Mich. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. 265 pages, 8½ x 11 inches. 822 illustrations. Price, \$1.25.

Eliminating all non-essential information, this book is designed to give the reader a quick-working knowledge of basic shop tools, machines, and instruments, and the fundamental opera-

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tions of machine shop work. It tells how all machines and tools used were developed, how they are constructed, and how to operate them. The book explains heat treatment and gearing. It also includes the mathematics needed for shop work and stresses safety rules. Every step of machine shop work is presented clearly both in text and illustration.

Contents of the book are as follows: Decimal Equivalent; Formulas; Small Tools; Rules; Micrometers; Vernier Gages; Chisels and Chipping; Hack Saws and Sawing; Files and Filing; Soldering; Shop Review; Drills and Drilling Operations; Tapers; Threads; Gearing; Cutting Tools; Shaper; Planer; Lathes; Turret Lathes; Milling Machine; Gages and Gage Blocks; Heat Treatment; Abrasives and Grinding Wheels; Grinding Machines; Routing of Bench Tool Work.

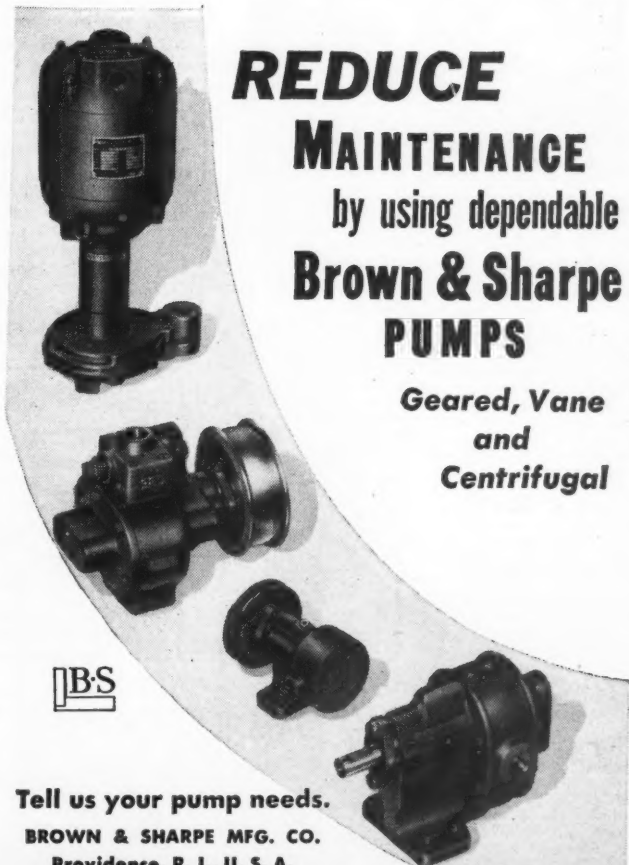
Lessons in Practical Arc Welding. By W. J. Chaffee. Published by Hobbart Trade School, Inc., Box EW-2, Troy, Ohio. 188 pages. Paper cover. Price, 75c (special prices to schools).

Written in easy-to-understand language, this book contains the complete series 41 arc welding lessons offered at the Hobbart Trade School. Chapter headings range as follows: Preliminary Instructions; Starting and Manipulating the Arc;

Welding Common Joints with Bare Electrodes; Welding Light Gauge Sheets with Coated Electrodes; General Welding with Coated Electrodes in the Flat Position; General Welding with Coated Electrodes in the Horizontal and Vertical Positions; General Welding with Coated Electrodes in the Overhead Position; Pipe Welding with Coated Electrodes; Welding Cast Iron; and Special Practice and Tests. The text also includes a suggested classroom procedure and ready reference index.

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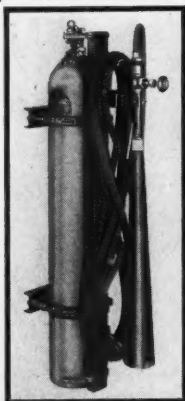
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Magnetic Tools and Appliances in Engineering Production. By E. Molloy. Published by the Chemical Publishing Co., Inc., 229 King St., Brooklyn, N. Y. 116 pages. 101 illustrations. Cloth binding, board covers. Price, \$2.50.

This book, as the name implies, deals with the applications of magnetic tools and appliances to production in up-to-date engineering works, all applications being illustrated and described in detail. Tools and appliances treated include magnetic chucks, magnetic clutches, lifting magnets, magnetic brakes, magnetic separators, and equipment designed for the magnetic detection of flaws in engineering materials.

Plant Literature

Radiac Type "N" Abrasive Wet Cut-Off Machine. A bulletin containing illustrated and descriptive information, together with complete specifications, on the Radiac Type "N" Abrasive Wet Cut-Off Machine for cutting-off bar, tubing, and formed shapes is now being distributed by A. P. de Sanno & Son, Inc., 440 Wheatland St., Phoenixville, Pa. Copy free upon request.

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Simmons Heavy Duty Lathe. An eight-page bulletin illustrating and describing the Simmons Heavy Duty Lathe, available in 48 and 54-inch sizes, is now being distributed by the Simmons Machine Tool Corp., 1745 N. Broadway, Albany, N. Y. Copy free upon request.

An-cor-lox Lock Nuts. A six-page comprehensive folder on An-cor-lox Lock Nuts has been prepared by the An-cor-lox Division, Laminated Shim Co., Inc., 86 Union St., Glenbrook, Conn. The folder is replete with diagrammatic, photographic, and factual matter on An-cor-lox styles, materials, designs, and finishes; application instructions, and suggestions for parts conversion to the An-cor-lox function. Copy free upon request.

"Cecostampings" is the title of a 34-page bulletin released by the Chambersburg Engineering Co., Chambersburg, Pa., illustrating and describing the construction, operation, features, various applications, and so on, of the Chambersburg Cecostamp, a high production impact type stamping machine for forming thin hot work. Numerous parts (Cecostampings) produced by the Cecostamp are shown on several pages of the bulletin. Also included are complete specifications of the Cecostamp as well as other helpful data. Copy of Bulletin No. 276 free upon request.

Johnson General Purpose Bronze Bearings are described in this four-page bulletin now being published by the Johnson Bronze Co., 590 S. Mill St., New Castle, Pa. Copy free upon request.

Gisholt Performance Data Sheets Nos. 50 to 53 inclusive now available from the Gisholt Machine Co., 1219 E. Washington Ave., Madison, Wis., are based on studies made in plants manufacturing tools, pulverizing equipment, hoists, and automotive trucks.

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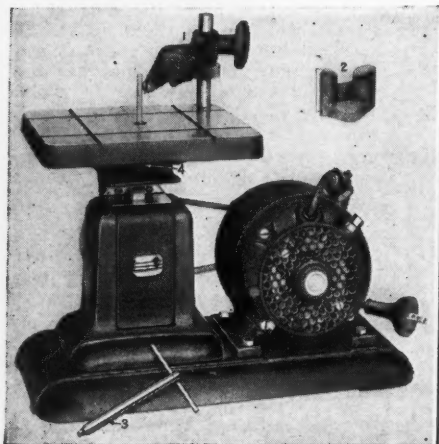
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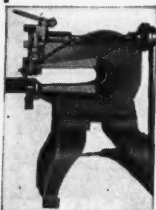
Chicago, Ill.

Hassall Decimal Equivalent Chart. For the convenience of technical men, John Hassall, Inc., 394 Oakland St., Brooklyn, N. Y., has issued a handy chart of decimal equivalents. The chart is printed in three colors for convenience in reference and is available free of charge.

Sturdimatic Heavy Duty Live Centers for lathes, grinders, milling machines, screw machines, and so on, are described and illustrated in a four-page bulletin released by the Sturdimatic Tool Co., 5222 Third Ave., Detroit, Mich. Complete specifications are given. Copy of Bulletin 542 free upon request.

Federal Shell Inspection Gages. Federal Products Corp., 1144 Eddy St., Providence, R. I., has prepared a catalog containing illustrated, descriptive, and tabular information on various types of dial indicator gages for fast and accurate inspection of shell and bomb parts. Copy of the catalog is available free of charge to any plant manufacturing shells, small arms ammunition, bombs, and other materials of this type.

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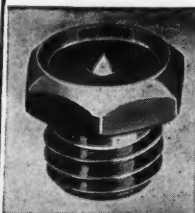


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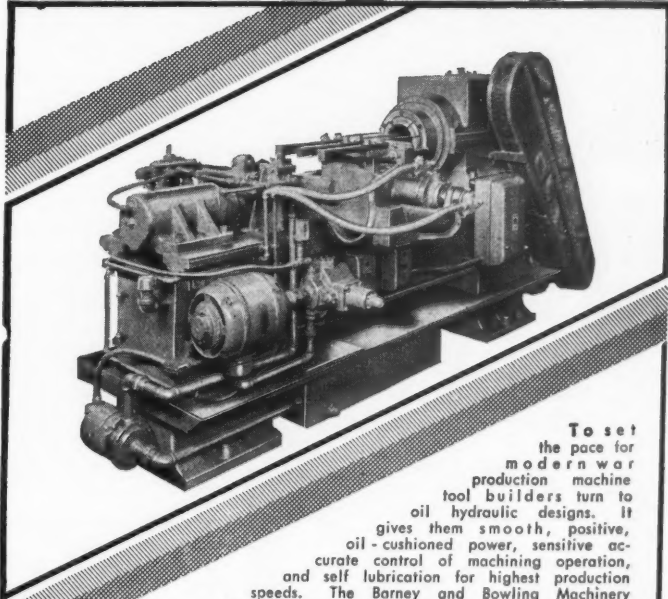
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Graham Drill Speeder or High Speed Drilling Attachment for speeds up to 3,000 r.p.m. is illustrated and described in a four-page folder prepared by The Graham Mfg. Co., 69 Willard Ave., Providence, R. I. Copy free.

"How to Cut Screw Threads in the Lathe" is the title of a 25-page bulletin prepared by the South Bend Lathe Works, Dept. 4Z, South Bend, Ind., which contains information on the setting of a lathe for cutting various pitches of screw threads; setting cutter bits; formulas; multiple threads; metric threads, and so on. Price 10c, but sample copies of the bulletin (No. 36A) will be sent free of charge to shop superintendents and apprentice supervisors.

Knu - Vise Toggle - Action Clamping Tools Catalog No. 4. In the pages of this 16-page catalog, Knu-Vise Products Co., 6432 Cass Ave., Detroit, Mich., presents the different types of toggle action tools manufactured in its plant, their applications to various types of industry, and the construction. Tools listed include various types of toggle clamps, spring stop gages, universal vise fixtures, hand squeeze riveters, and toggle locking pliers. Copy free upon request.

RACINE



Shakeproof Cowl Fasteners. A 23-page catalog containing engineering and procurement data on Shakeproof Cowl Fasteners for use in attaching cowling and other removable parts has been prepared by the Aviation Division of Shakeproof Inc., 2501 N. Keeler Ave., Chicago, Ill. Copy of Catalog AD-1 will be sent free of charge to purchasing agents, engineers, and so on, upon receipt of a request addressed on a company letterhead.

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Trabon Reversing Lubricating System. A four-page bulletin illustrating and describing the design and operation of a reversing lubrication system for use in lubricating machines and machinery of various types is now being issued by the Trabon Engineering Corp., 1814 E. 40th St., Cleveland, Ohio. Copy of Bulletin No. 423 free upon request.

Spartan Hack and Band Saw Chart. Spartan Saw Works, Inc., Springfield, Mass., is now distributing a handy chart showing recommended teeth and speed

of Spartan Hack Saws (hand and power blades) and Band Saws for cutting various materials. The chart is coated with a thin lacquer spray so as to keep it from becoming soiled and is provided with a hole for convenient hanging. Chart free upon request.

"The Care of Gage Blocks." The George Scherr Co., 130 Lafayette St., New York, N. Y., is now offering a four-page leaflet entitled "The Care of Gage Blocks," which illustrates and describes up-to-date methods of increasing the usefulness and life of gage blocks. Copy free upon request.



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AL Handbook of Special Steels. A 126-page, Wire-O bound handbook on the properties, uses, and fabricators of Allegheny Ludlum Steels has been prepared by the Allegheny Ludlum Steel Corp., Pittsburgh, Pa. The handbook has been designed to be as helpful as possible in the selection of the proper types of tool, stainless, electrical, and carbon steels in the various forms produced by Allegheny Ludlum. Tables have been used to a large extent to facilitate quick reference. For those who need to supplement their facilities on the outside, lists of sources of supply in the Tool and Stainless fields have been added.

Contents of the book are as follows: General Information, Tool Steels, Special Products, Tool Steel Buyer's Guide, Nitralloy Steels, Stainless Steels, Stainless Steel Buyer's Guide, Electrical Steels, Carbon Steels, Tables and Reference Material.

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Wagner 1941 Fan Bulletin and Dealer Sales Manual. This 20-page bulletin, publication of the Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo., illustrates and fully describes the complete line of Wagner cooling and ventilating equipment for 1941. The bulletin, which is designated as the FU-41, also contains installation and application data, thereby making it especially helpful to dealers, contractors, and so on, for use as a sales manual. Copy free upon request.

"Grinding Cutter Bits." An informative 12-page bulletin on grinding lathe tool cutter bits has been prepared by the South Bend Lathe Works, Dept. 4Z, South Bend, Ind. The bulletin, which is designated as the No. 35, covers the identification and application of the various cutter bits; methods of grinding; correct angles for grinding the various types of tools and for machining various materials. Price 10c, but sample copy of this bulletin will be sent free of charge to shop superintendents and apprentice supervisors.

Fitchburg Spline and Gear Grinders. Fitchburg Grinding Machine Corp., Fitchburg, Mass., is now issuing a 20-page, profusely illustrated catalog covering its spline and gear grinders. The catalog describes the construction features, operation, and so on, of the machines and contains several application photographs. Various attachments for the grinders are also illustrated and described and complete specifications included. Copy of catalog free upon request.

Machine Design Application Sheet No. 73. This sheet, one of a series of machine design sheets issued by The Lincoln Electric Co., Cleveland, Ohio, discusses and illustrates by means of drawings several possible welded designs of the eye and clevis parts of a stamping press. Copy free upon request.

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"Hydraulic Jacks." The Watson-Stillman Co., Roselle, N. J., has prepared a four-page bulletin illustrating and describing independent-pump jacks, vertical outside-pump jacks, and horizontal outside-pump jacks. Complete specification tables are given for all three types, including capacity, maximum rise, ram diameter, weight, and identification number. The bulletin also lists sizes of flexible copper pipe and fittings used with the independent-pump jacks. Copy of Bulletin 710-A free upon request.

"Helping Industry Help America" is the title of an interesting and profusely illustrated 20-page catalog now being issued by the Sun Oil Co., Finance Bldg., Philadelphia, Pa., containing actual case histories of how Sun Oil industrial engineers are helping American Industry produce more through the recommended application of proper petroleum products in metal-working, metal finishing, general lubrication, processing, mining, textile manufacturing, and so on. Copy free upon request.



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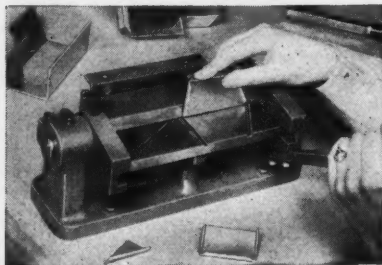
Shop Wall Charts. A circular listing a complete series of 40 wall charts and blueprints covering such subjects as drill sizes, pitch diameters of screws, standard fit tolerances, correct use of calipers, application of lathe tools, and so on, is now being distributed by the South Bend Lathe Works, Dept. 42, South Bend, Ind. Copy of Circular PBL free upon request.

Cramp Alloys. A 40-page engineering reference catalog of brass, bronze, and iron alloys has been published by the Cramp Brass and Iron Foundries Division of The Baldwin Locomotive Works, Philadelphia, Pa. Contents include details concerning P-M-G, a silicate bronze made without tin, and the composition and physical properties of 31 other alloys. The catalog illustrates products made of Cramp alloys, contains a list of Cramp brass and iron products, describes the effects of various elements on iron, and discusses terms used in materials testing. Copy free upon request.

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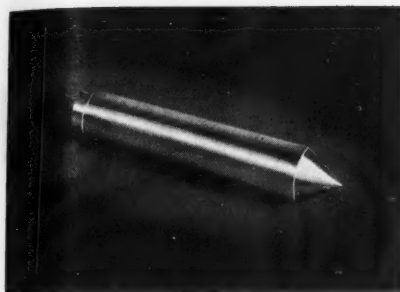
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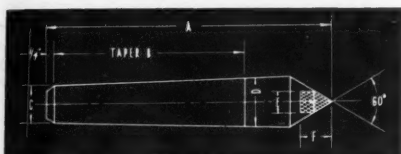
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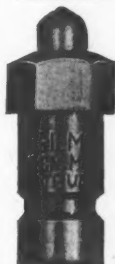
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1. Shaft Straightening Attachments

Bulletin No. 366 illustrates and describes General shaft straightening attachments for straightening practically any kind of shaft under a power press. General Manufacturing Co., 6433 Farnsworth, Detroit, Michigan.

2. Band Saws

A 16-page booklet featuring Atlantic Metal Cutting Band Saws has been issued by Atlantic Saw Manufacturing Co., New Haven, Conn.

3. Diamond Tools

"The Care and Maintenance of Diamond Tools" is the title of a 24-page booklet issued by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y.

4. Welding Data

Arcos Technical Bulletin No. 5 presents data on welding with Arcos stainless electrodes and welding air hardening steels with 25/20 electrodes. Arcos Corporation, 401 N. Broad St., Philadelphia, Pa.

5. Pantograph Engraver

Illustrated Catalog Type A, issued by New Hermes Inc., 821 Broadway, New York, N. Y., details Pantograph Engraver for lettering and numbering.

6. Vertical Mill and Jig Borer

G & S Vertical Mill and Jig Borer for milling, boring, facing and routing small parts for instruments, arms and munitions is detailed in folder available from Granite State Machine Co., Inc., Manchester, N. H.

7. Shaper

Lewis Semi-Finished 10-In. Shaper is detailed in catalog of Lewis Prod-

ucts available from Lewis Machine Tool Co., P. O. Box 116, Sta. A., Los Angeles, Cal.

8. Surface Plates

Descriptive folder issued by Acme Tool Co., 200 Church St., New York, N. Y., gives details on Acme surface plates, angle plates and straight edges.

9. Scientific Metal Cleaning

Four types of metal cleaners covering practically every metal cleaning operation are described in a bulletin which is now being issued by The DuBois Company, 1120 W. Front St., Cincinnati, Ohio.

10. Milling Machine

Circular describing and illustrating new vertical milling machine is available on request from Sommer & Adams Company, 18511 Euclid Avenue, Cleveland, Ohio.

11. Shop Envelopes

The Wade Instrument Company, 1422 East 109 St., Cleveland, Ohio, is offering new folder describing various types and sizes of window envelopes in which to keep blue prints, orders and specifications.

12. Machine Tool Drive

New bulletin issued by Industrial Equipment Div., The Master Electric Co., Dayton, Ohio, illustrates and describes the Masterdrive gear head motor for powering machine tools.

13. Hack Saw Chart

Handy Spartan saw users chart outlines recommendations on speed, teeth and feeds for Spartan Hack and Band Saws. Issued by Spartan Saw Works, Inc., Springfield, Mass.

14. Cutting Oil Booklet

Gulf Oil Corp., Gulf Bldg., Pittsburgh, Pa., has available new booklet containing information on properties and uses of improved Gulf cutting oils, and valuable and practical notes on cutting speeds, tool settings, etc., in the machining of nickel, stainless, and high speed steels, the wrought bronzes and aluminum, plus other data.

15. Grinding Oils and Lubricants

A helpful 32-page booklet titled "Grinding Oils and Lubricants for Precision Grinding" is available from The White & Bagley Co., Worcester, Massachusetts.

16. Tungsten Electrodes

Vascoloy-Ramet Corporation, North Chicago, Ill., has issued bulletin featuring tungsten electrodes for atomic hydrogen welding.

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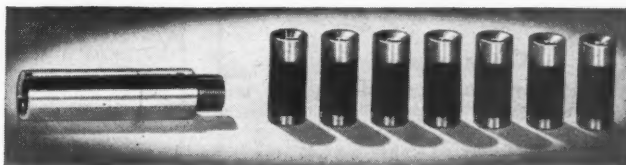
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"Grits and Grinds" Vol. 33 No. 5. This edition of "Grits and Grinds" has as its lead article an interesting one entitled "Plug Gages, Too, Can Be Reconditioned." Following this are other illustrated and descriptive items headed "A Comparative Means of Grading Cylindrical Surface Finish," "Lessons in Grinding by Motion Pictures," "Special Refractory Burner Blocks and Cement," and "Compound Wheel Forming Device for Norton Cylindrical Grinders." Also included are cartoons No. 8 and 9 of the series "On the Grinding Line."

Copy of "Grits and Grinds" Vol. 33 No. 5 can be obtained free of charge by writing to the Norton Company, Worcester, Massachusetts.

"The Cleaning of Industrial Floors." The Magnus Chemical Co., Inc., Garwood, N. J., is now distributing a 24-page technical bulletin entitled "The Cleaning of Industrial Floors." This bulletin, it is claimed, has been written not only from the viewpoint of cleaning floors for personnel safety by the elimination of greasy, slippery floors, but from that of cleaning floors for



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the Gun"

reproduced on page 176 of this issue, is available from Elliott Service Company, Inc., 219 East 44th St., New York, N. Y., in 9 x 12-inch size, at 1 cent per copy.



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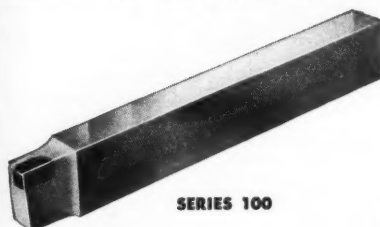
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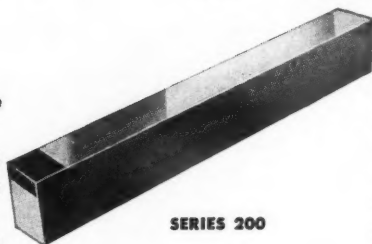
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Left Hand—Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
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R-103	L-104	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
R-105	L-106	$\frac{7}{8} \times \frac{7}{8} \times 3$
R-107	L-108	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$

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Tool No.	Shank Size
200	$\frac{1}{4} \times \frac{1}{4} \times 2$
201	$\frac{5}{16} \times \frac{5}{16} \times 2\frac{1}{4}$
202	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
203	$\frac{7}{8} \times \frac{7}{8} \times 3$
204	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$



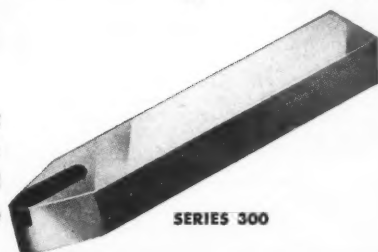
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Below— 300 Series

Tool No.	Shank Size
300	$\frac{1}{4} \times \frac{1}{4} \times 2$
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302	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
303	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$

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cal information on cutting speeds, tool settings, and so on, in the machining of nickel steels, stainless steels, high speed steels, wrought bronzes, and aluminum, plus facts on cemented carbides as used in metal cutting and data on tool supports, toolholders, and tool grinding. The text is supplemented by many diagrams and tables.

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The Last Word . . .

Saboteurs

WHEN the employees of a certain aeronautical products manufacturing plant in Detroit opened their pay envelopes week before last, many of them found, along with the usual stipend, a German banknote and a word of explanation:

"The extra pay enclosed is your reward for failing to report for work one day last week. This money comes from a country that is glad to pay you not to make supplies for our soldiers. When you don't work, you work for the enemy."

It is both possible and likely that some of those men failed to report for work for some very good reason, but it is also likely that many of them—and many other thousands of workmen throughout the United States—take advantage of every excuse to take a holiday without giving serious thought to what that holiday means at this critical moment. For this is a critical moment—the most critical moment that the United States of America has ever seen.

This war is a war of production, and the winning nation will be that nation which can build the most ships and tanks and planes and guns and which can produce the most fighting *materials* for its soldiers to use, the most oil with which to fly its planes, the most coal to operate its power plants and its locomotives and the most metals from which to make the parts for all of these units.

The vast scope of the task is suggested by the fact that there are 57,000 parts in a 10,000-ton cargo ship, 17,000 parts in a tank, and 30,000 parts in a large bomber. And there are as many as fifty-five and sixty operations on some of those parts. Each operation is assigned to a workman who knows, or is trained, to operate that machine or perform that operation; consequently when a workman fails to report on the job, it means that production is halted while the foreman finds and fetches another operator to take over that task—and it is not usual to have a number of trained men standing idle just so that one will be available if needed.

So it is easy to see that one absent workman from an important operation may cause a serious stoppage or slowing-down of production and thus may contribute, indirectly, to the success of the enemy and the defeat of the American forces in the field.

The soldier in the field cannot quit or stay in bed in the morning every time he has a hangover, or a headache, or has eaten something that doesn't agree with him; he has to be in his place in the line every morning when the sergeant's whistle blows. A fighting man has to be on the job every minute, and no alibis. And not only does he have to be there; he has to be ready to face the guns of the enemy when the time comes to fight.

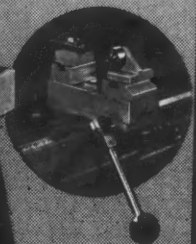
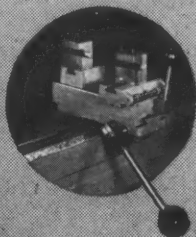
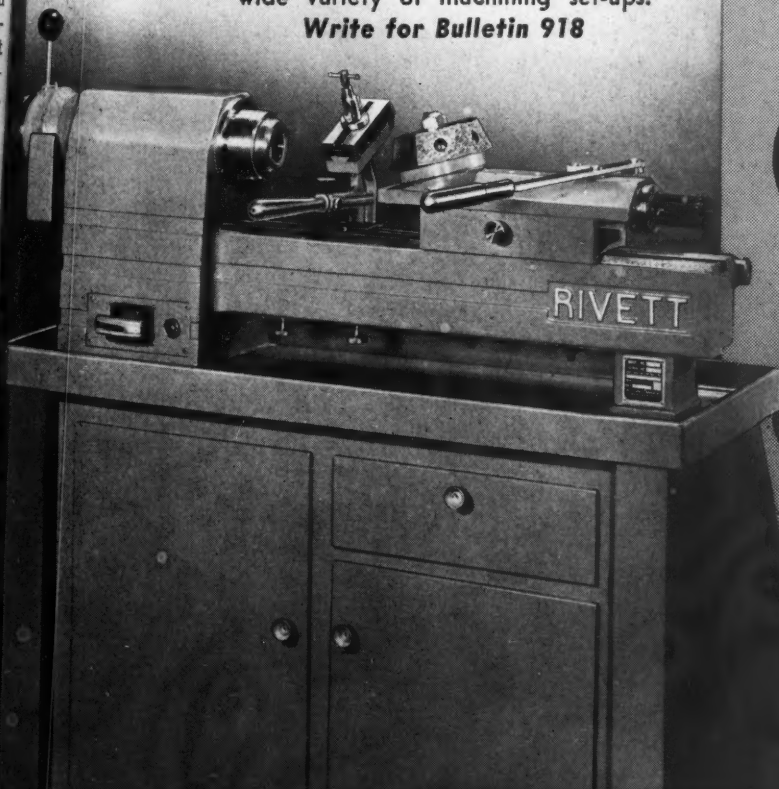
The soldier who produces the shells is as important to the war effort as the soldier who shoots them, and considering that the one who makes them is privileged to stay safely at home, the least he can do is to keep on the job, producing, every minute of every day.

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3 "LOGAN" Model "P"
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4 "LOGAN" Parallel
Grip Collet Chuck

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August

MODERN Machine Shop

CINCINNATI, OHIO

AUGUST, 1942

VOL. 15, No. 3

We Present ---

—as our feature article this month—the third article in the series describing Buick manufacturing methods in the production of Pratt & Whitney aircraft engines. This month the article deals with the tools and equipment in use in one of Buick's huge automobile plants which has been revamped for aircraft part production. Some interesting tools are shown.

—on page 114—an article on the use of plastics for making tools and dies as this material is used in the plants of the Lockheed and Vega Aircraft Corporations. A great deal is being said about plastics in the various magazines this month, and we hope that our angle will be a little different from the others.

—a description of an automatic alarm guard system which is the best that we have ever found for manufacturing plant use. This system is an "Acoustic Fence" which not only sounds the alarm at headquarters when someone is trying to climb over or under the fence, but actually tells at what point in the fence the intruder is trying to affect entrance. This important article will be found on page 128.

—on page 140—an article presenting the fundamental considerations in the design and manufacture of a spring. Written in a practical manner, the article should be of interest and use to everyone who uses coil springs.

—on page 162—some interesting operations in the manufacture of shells.

—on page 172—some excellent pointers on the saving that can be made by welders who will pay attention to the proper size torch tip, excessive pressure, leaking hose, and so on.

—on page 186—an idea that has been developed by the Warner & Swasey Company of Cleveland, Ohio, for recognizing and rewarding suggestions which result in increased production or lower manufacturing costs. This idea could well be adapted by many other manufacturers.

—on page 194—another story on aircraft engines, but this time it has to do with the fine instruments and tools that are used in the inspection of the engine parts. This article provides some idea of the care that is taken to make sure that each and every part in an aircraft engine is sound and accurate.

—a number of useful hints in the section "Ideas from Readers" and the usual announcements of new tools.

Interesting and worthwhile material—all of it.

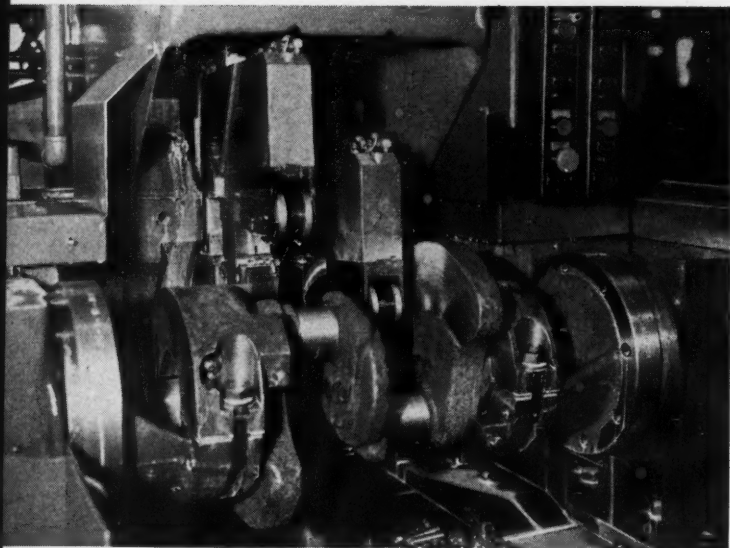


Fig. 21—Turning the crank pins and facing the cheeks on a P & W airplane engine crankshaft. This machine, built by the Crankshaft Machine Co., Jackson, Michigan, was especially designed for this operation.

Aircraft Engine Part Production at Buick, III

In this article, the third of the series, the author describes some of the more interesting manufacturing operations on parts for Buick-Pratt & Whitney aircraft engines

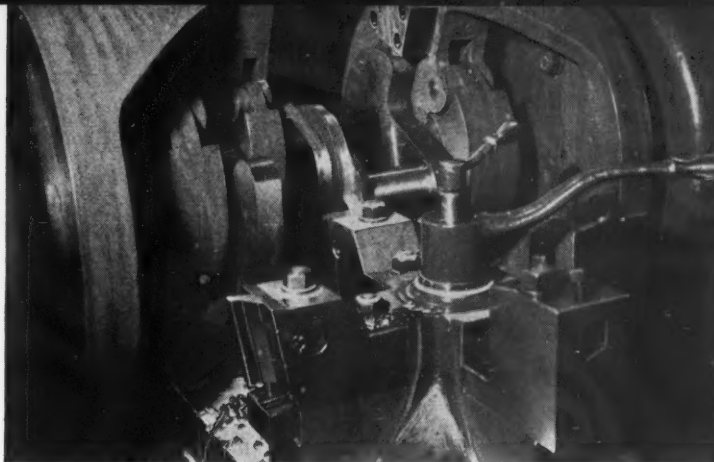
By HOWARD CAMPBELL
Editor, MODERN MACHINE SHOP

IN the two previous articles of this series the reader was taken on a theoretical tour through a huge new aircraft engine plant recently built by the Buick Motor Division of General Motors in the Middle West; in the two last articles of this series the reader will be taken on an imaginary trip through huge automobile factories which have been

converted to the production of parts for aircraft engines.

The conversion of an automobile plant to an aircraft manufacturing plant is not as simple a task as many would believe. Most of the machine tools cannot be used for both classes of work. Many of the machine tools that are especially designed or adapted for automobile engine work are too

Fig. 22—The center section of the crankshaft is turned in this LeBlond crankshaft lathe. Both headstock and tailstock are power-driven, eliminating any possibility of springing the crank out of line.



light or of the wrong design or otherwise unadaptable for aircraft engine work.

For instance, the crankshaft for a radial airplane engine is much shorter, heavier, in section, and altogether of different shape than the six-cylinder or eight-cylinder straight-in-line automobile engine crankshaft. For the turning operation on the aircraft engine crankshaft a special machine is used, illustrated in Fig. 21. This machine, built by the Crankshaft Machine Co., Jackson, Michigan, was especially designed for the machining of this crankshaft.

In the operation shown the pins are rough turned and the cheeks are

rough faced. The shafts are held in pot chucks and rotate on their own centers. The tool cutting arms are equipped with rollers which rest on the pin bearing during the cutting operation so that a large share of the cutting thrust is taken by these rollers, thereby eliminating part of the distortion in the finished crankshaft.

The shaft is turned in 10 minutes, the feed being hydraulically operated by the use of Vickers equipment. The machine is driven by a direct current motor with rheostat providing a spindle speed of from 9 to 32 r.p.m. The

Fig. 23—This special horizontal W. F. & J. Barnes two-spindle drilling machine is used to drill the holes through the axes of the propellor shafts. The drills are each 1-15/16 inch diameter by 38½ inches long.



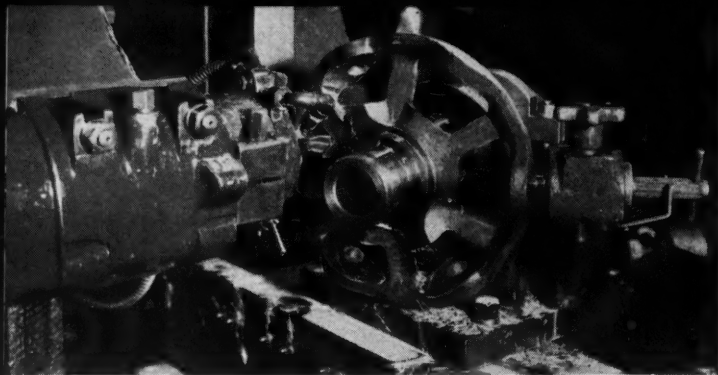


Fig. 24 — The spaces between the spokes of the propeller shaft are machined in this P. & W. Keller toolroom machine. The cutter is a spiral mill.

machine is semi-automatic, the operator being required only to load and unload the machine.

Four separate operations are performed on these lathes, each with a different set up, as follows:

1. Spot turn pin bearing and face part of cheeks.
2. Finish turn pin bearing and face balance of cheeks.
3. Face cheeks after crankshaft has been carburized.
4. Face cheeks after crankshaft has been hardened.

In the semi-roughing operation 0.062 inch of stock is left for finish turning and in the finish turning operation from 0.015 to 0.025 inch of stock is left for finish grinding.

The center section of the crankshaft is turned in the LeBlond crankshaft lathe shown in operation in Fig. 22. This machine has duplicate headstock and tailstock to which power is applied by means of a heavy spline shaft through the center of the bed

to the heavy helical face gears in both fixtures. This powerful drive to both ends of the crank eliminates any possibility of springing the crank out of line.

The tools are carried in a revolving four-position turret which is indexed accurately by means of an index ring and plunger. The tools are set into the holders vertically so that they can be ground repeatedly without changing their form. The radius tool can be seen on the turret arm at the left in the illustration. A limit of 0.003 inch is allowed on the diameter.

The operation of drilling a hole longitudinally through each of two propeller shafts is shown in Fig. 23. The operation is performed with a special horizontal W. F. & J. Barnes two-spindle drilling machine using drills $1\frac{1}{8}$ inch diameter by $38\frac{1}{2}$ inches long. The hole through the propeller shaft is 19 inches long, but the drills have to have extra long shanks to guide them through the bushings.

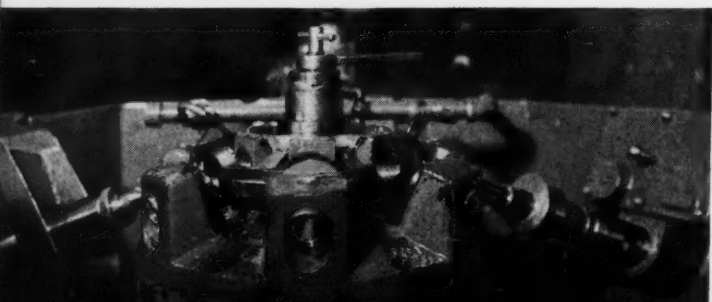


Fig. 25—Six holes in the propeller shaft, equally spaced radially, are drilled, reamed, and step reamed in this Natco special three-spindle machine.

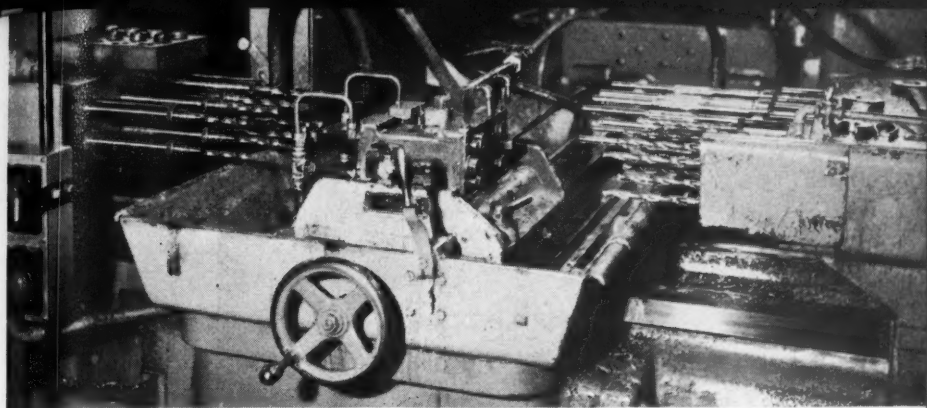


Fig. 26—The bolt holes in the master connecting rod are drilled and reamed in this Foote-Burt Horizontal Multiple Drill. The drilling is done from both ends of the machine.

Each drill is hollow so that coolant can be forced through the drill from connections at the rear-end of each shank.

The drills are held stationary while the propeller revolves at a speed of 62 r.p.m., providing a cutting speed of 31 surface feet per minute. Hydraulic feed is used, the feed being 0.010 inch per revolution of the work.

In the operation shown in Fig. 24 the propeller shaft is clamped in a fixture on a table of a Pratt & Whitney Keller toolroom machine while a spiral milling cutter mills out the "windows" or spaces between the spokes. These spaces must be actually machined in order to provide for gears which operate in these spaces something like the differential in an automobile transmission.

Provision is made for actually indexing the work so that the aperture will not only be machined to given dimensions, but so that the aperture will be evenly spaced within close limits. A limit of 0.004 inch is allowed from the center of the aperture to all sides. Each surface is machined twice; the roughing cut being taken with a one-inch spiral cutter and the finishing cut with a $\frac{3}{4}$ -inch cutter.

In the illustration Fig. 25 a Natco three-spindle special machine with six

indexing positions, is shown set up for drilling, reaming, and step reaming six holes in the propeller shaft. Each hole is actually two holes of different size, one in the outer section and one in the inner section, but the holes must be in perfect alignment.

The propeller shaft is held in a ro-

Fig. 27—Connecting rod pin holes in the master rods are honed to an accuracy of 0.0002 inch in this Barnes Vertical Honing Machine.



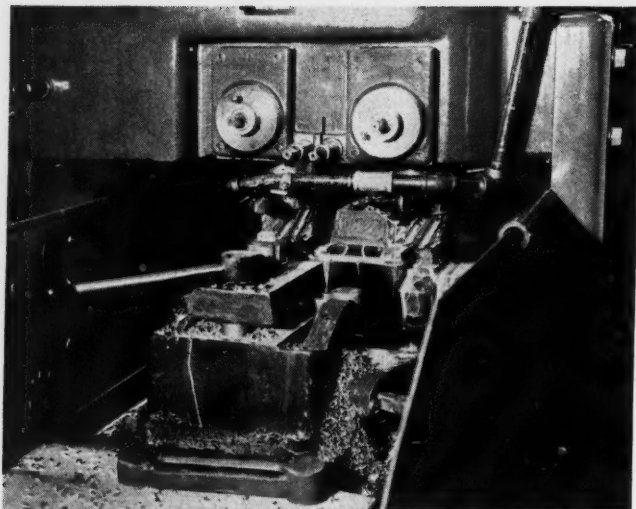


Fig. 28 — Milling the faces of the ends of the link connecting rods. The ends are milled simultaneously and two fixtures are used so that no time is lost on this operation.

tating fixture with the shaft end down, the piece being located in position by means of a cam lock and screw clamp. A double set of tools at the front of the machine, as shown in the picture, provides for finishing the six holes in three operations.

In Fig. 26 is shown the Foote-Burt Horizontal Multiple Drill with which the bolt holes in the master connecting rod are drilled and reamed. The rod is held in a sliding fixture which is moved from rough drilling position to finish drilling position and then to reaming position. With drills operating from both ends of the machine, the four bolt holes are drilled in from each side half way, cutting the machining time in half. The rough drilling completed, the fixture is moved to the finished drilling location where another $\frac{1}{8}$ inch of stock is drilled out of the holes. The fixture is then moved to the reaming position where

the master rod are honed to an accuracy of 0.0002 inch in the Barnes Vertical Honing machine shown in Fig. 27. Here the master rod is located on a swivel fixture by which each of the pin holes can be brought into line with the machine spindle in rotation. A four-stone hone is used which produces a mirror finish on the interior surfaces of the holes. The operator is shown gaging one of the holes with the dial gage to make sure that the hole is finished within the limits.

The faces on the ends of the link connecting rods are machined by milling in the Sundstrand Milling machine shown in operation in Fig. 28. Two fixtures are used so that both ends of a rod can be milled simultaneously and so that one piece can be in process while the other is being changed for a new piece. The milling is done with spiral inserted blade cutters.

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Using Plastics for Jigs and Dies

This article was abstracted from a comprehensive report on the developments made to date by Lockheed and Vega on the use of plastics for drill jigs and forming dies in aircraft tooling

AS a result of an investigation into the possibilities of using plastics for aircraft tooling which was recently made by the Lockheed and Vega Aircraft Corporations, these companies in the past few months have begun the manufacture of tools made from plastic materials. The investigation was prompted by the anticipated shortage of metals. Plastics are now being used in the construction of drill jigs and for forming dies that will stand up to 8,000 pounds pressure per square inch.

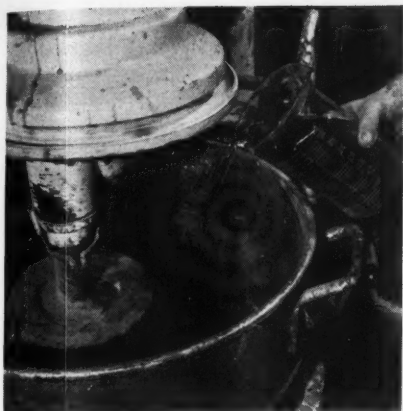
In this development it is interesting to note that considerable amounts

of time, from hours to months, are being saved in vital warplane production by the ingenious use of the walnut shell, which the housewife ordinarily tosses into the garbage pail, and by the inclusion as a part of aircraft factory equipment an ordinary baker's bread mixer and oven.

The investigation was originated by Mr. M. Basolo, of Lockheed, whose idea it was that drill jigs can be fabricated by securing the drill bushings to a master part, placing the part in a form, and pouring a molding of plastic materials around it. When the material has solidified in conformity with the contour of the part, the bolts holding the bushings in place can be removed and the jig can then be finished for use.



▲
Drawing the Resin from a Barrel Container into a Mixing Vat that is Mounted on Scales. Measurements are Computed by Weight



The Catalyst is Mixed with the Resin in a Standard Dough Mixer. This Catalyst Starts the Reaction that Transforms the Liquid into a Solid Mass

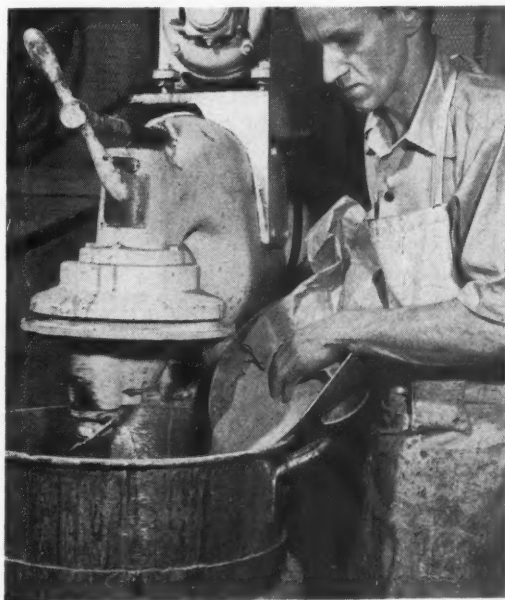
Up to the present time, drill jigs for the larger aircraft units have been constructed of wood with inserted metal bushings that are retained by steel nests or straps. However, the wood is often affected by moisture and soluble lubricating oils, which may cause the wood to swell or shrink unless it receives surface treatment and periodic maintenance.

The requirements for a satisfactory thermo-plastic material are that it be of such nature that it (1) can be cast at 225-325 deg. F., (2) can be reclaimed cheaply, (3) can be finished on standard wood working tools, (4) has sufficient impact strength to withstand shop handling,

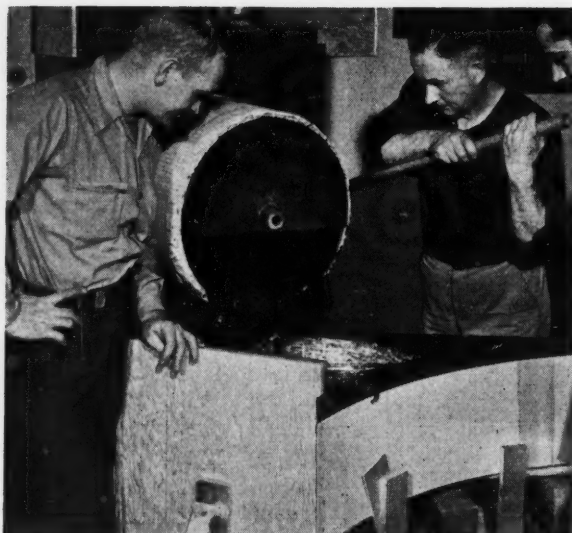
(5) does not exhibit brittleness at low temperatures or after aging, and (6) is resistant to lubricating oils, and to metallic chips produced in the drilling or other machining operation. In addition, means for controlling the shrink of the molding material should be available.

Of the several materials studied, Lockheed accepted a phenol acetone thermoplastic, while Vega at present is using an acid setting phenol formaldehyde thermo-setting composition that is composed of 25 to 30 per cent walnut shell flour, used as a filler, with resin and an acid catalyst or accelerator. Other good fillers include wood flour, masonite, and scrap plastic.

The plastics were accepted with reservations at first, but gradually the misgivings of the experimenters gave way to enthusiasm. Investigation in the plastic tooling field has brought to light several desirable features of interest to both company and



Flour Made from Ground Walnut Shells is Poured into the Mixer to Serve as a Filler



Pouring Hot Liquid Phenol Acetone Thermoplastic Into a Plaster Mold to make a Lock-head "Lightning" P-38 Wing-Root Fairing Drill Jig. Right: M. D. Basolo, Lockwood Shop Foreman who invented New Plastic Composition Used in Drill Jigs and Forming Dies

government. Among outstanding features are the following:

(1) Plastics may be substituted for steel and dural in many cases.

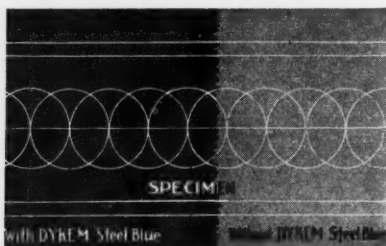
(2) Tools may be cast to a master part or plaster mold more quickly than by forming, milling, or hand fitting.

(3) Duplicate tools may be fabricated at less cost than the original due to the fact that the molds are saved.

(4) Duplicate tools may be made economically and quickly for transportation to other plants.

by means of pins, oversize holes having been drilled in the plastic plate to accommodate the bushing and cerromatrix. These bushings are especially designed for use in thermoplastics and are of sufficient wall thickness to eliminate the possibility of their becoming overheated and losing their positions.

In the manufacture of the bushings, incidentally, only the inside diameter is vital; thus an important saving in time is made. On one drill jig a saving of \$70.11 was made in the cost of the bushings alone.



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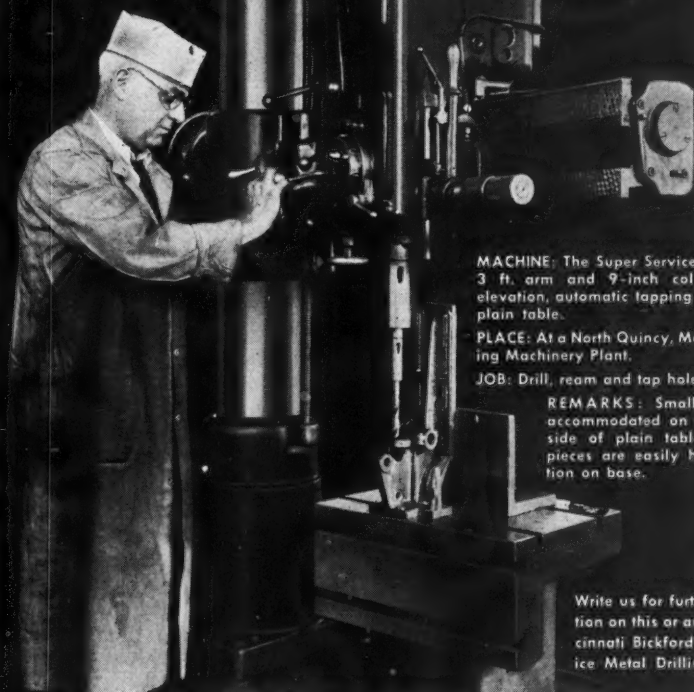
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not only included the determination of a suitable plastic material, but also the perfection of a technique for fabricating the jig by the use of such a material. This technique has been

For hydropress production tools where a minimum of $1\frac{1}{2}$ inch draw can be maintained through the application of external beads as stiffeners around lightening holes in flat work, production can be expedited by the use of two or more duplicate tools—which are cheap and easy to handle. The development work is done with a wood form block to which a plaster split mold is made. Thus duplicate tools may be cast out of plastic, the plaster split mold being saved against the event of breakdown due to rough usage in production.

Plastic will not “flow” under pressure; thus definite mold lines can always be maintained as long as a pressure of approximately 8,000 pounds per square inch is not exceeded. The only impact requirements of plastics are that the material be able to withstand dropping on a concrete floor, and withstand normal impact incurred in loading or unloading the jig or hydropress.

The development of the project has

worked out in some detail.

The type of part to which the process is best suited is an open contour, with or without “joggles.” The equipment required for making the plastic drill jigs of the material used by Lockheed consists of a jacketed kettle equipped with a device for agitating the mixture. The jacket around the kettle is for the purpose of containing a liquid bath which may be heated to maintain the kettle and contents at a given temperature. Without such a bath built around the kettle, maintenance of uniform temperature is extremely difficult.

The agitating device consists not only of a paddle arrangement, but the paddle is of such design that it continuously scrapes the material from the sides and bottom of the kettle. This is referred to in the trade as a “full scraper-type agitator.”

At Vega, the thermo-setting composition is mixed in an ordinary baker's bread mixer and then baked at 175 deg. F. in a cookie oven.

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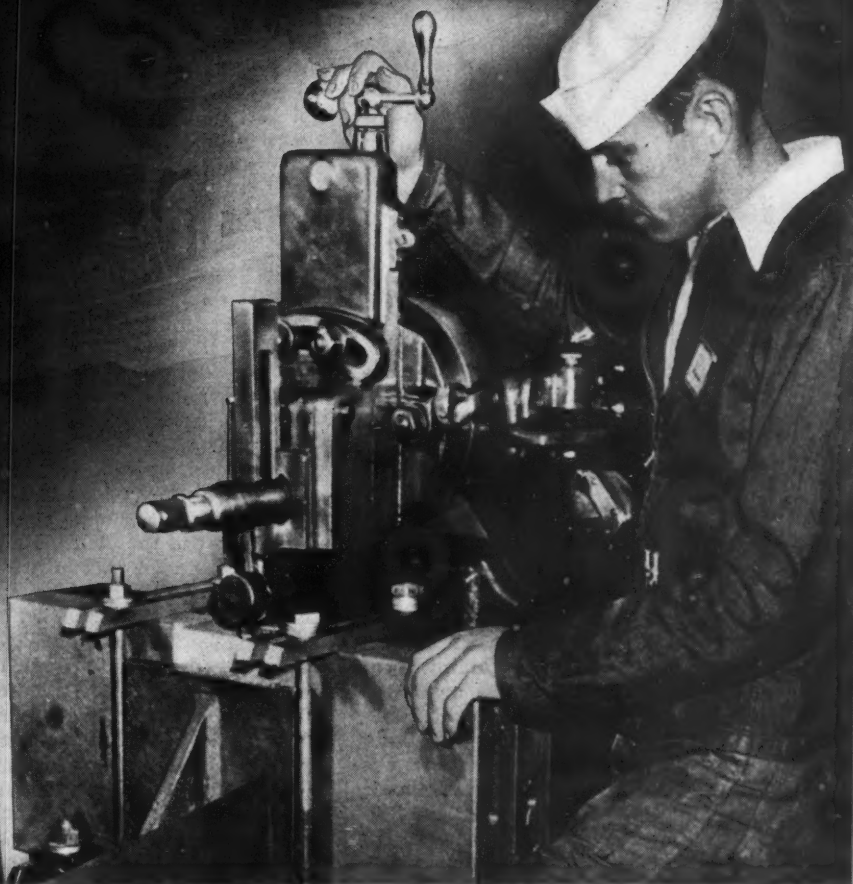
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Milling Plastic Nesting Block at Vega Aircraft Corporation Plant

When the cast is cool the retaining forms are removed and the concave-free surface of the block is finished on the joiner until flat. The cone-like plugs are removed, making the position of the drill bushing visible. A certain amount of care must be exercised at this point to prevent the joiner blades from striking the drill bushings. In practice the plastic is cut to within $\frac{1}{4}$ to $\frac{3}{8}$ inch of the external drill bushing face, and the hole to the drill bushing is chamfered as a finishing operation. Thermoplastic parts may not be sandpaper, as frictional heat causes gumming. However, a shave or floor scraper will produce an excellent surface.

Molded drill jigs are fabricated from Lockheed master part templets each of which contains master coordination holes. Drill bushings are bolted through the master coordination holes to the templet. This assembly is then placed in a retaining form and the plastic material is cast over the part and around the drill bushings. Shrink is controlled by having the retaining form extend above the master part. When the hot plastic first contacts the cold part it solidifies rapidly, freezing to the contour. As the remaining plastic mass progressively solidifies, plastic is supplied from the reservoir created by the retainer, terminating in a sunken surface on top.

To complete the jig, the part is placed between the drill plate and the next block and the assembly is clamped together. The alignment of the coordination holes in the part and the drill plate is checked by inserting the proper size drill rod through the drill bushing and into the coordination holes in the part. This having been verified, the $\frac{3}{8}$ -inch holes are drilled through the ends of the assembled jig to accommodate the alignment bushing, and the jig is then unclamped.

The alignment bushings, which are serrated about their peripheries, hold securely when driven into place. The alignment pins are then driven into the alignment bushings in the drill plate, where they are held in place by



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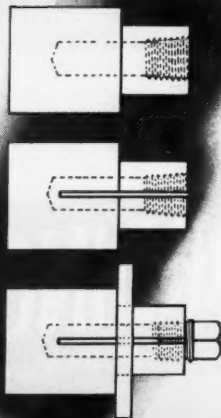
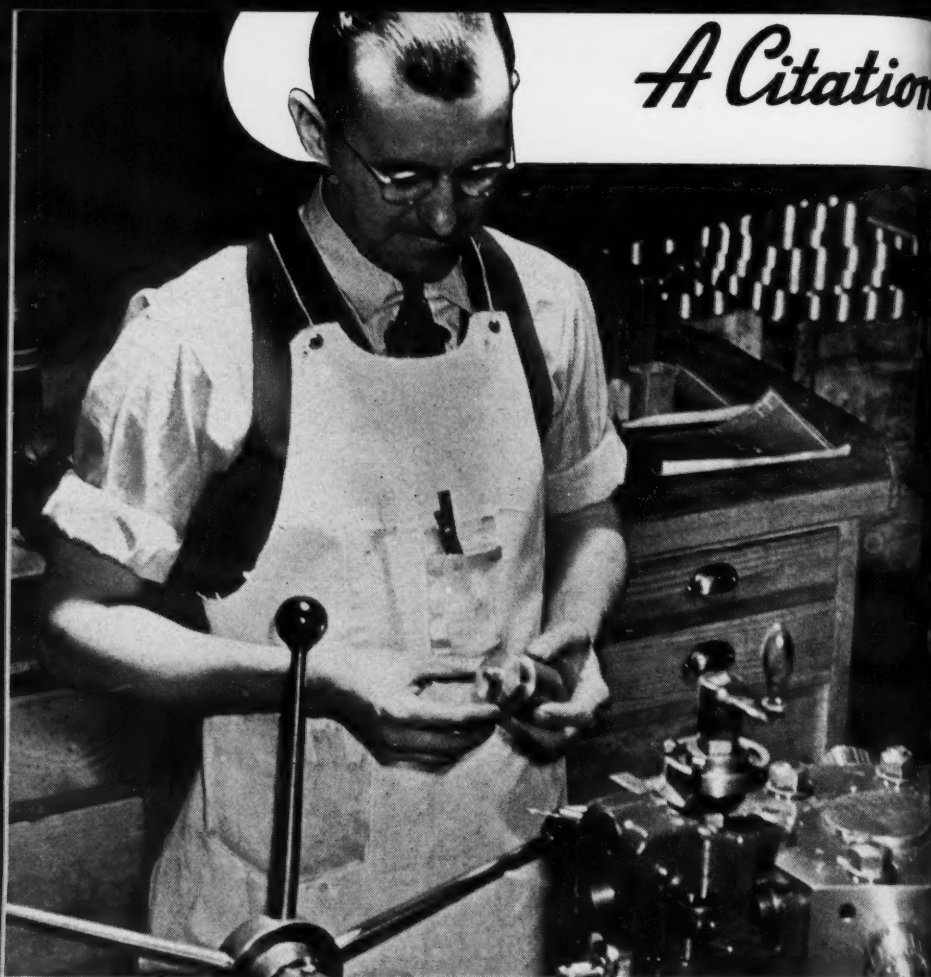
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The Light, Strong Plastic Tools are Well Liked in the Production Departments. If Drill Jigs such as These were made of Steel, or even of Dural, They would be Heavy and Much Harder to Handle. In View of the Mounting Shortage of Metals, Plastics now Play an Important Role in the War Effort

heating a small amount of the plastic and flowing it into holes in the back of the drill plate.

Limit pins are driven into the drill plate at the ends of the master part, or may be placed through the part if it happens to contain pin holes used to locate the part during forming.

In jigs of acetol resin the position of a drill bushing may be altered by "drifting." Drifting is accomplished by inserting a torch-heated drill rod in the bushing, allowing the heat to diffuse momentarily, and then applying force in the direction of the desired movement.

If the part from which the drill jig is cast is extremely large, an alternative method of affixing the drill bushings is available. First the drill plate and the next block are cast as outlined above, except that the drill bushings are not bolted to the master part. When the drill plate has been planed to the length of the drill bush-

ing, the master part is nested and holes are back-drilled through the templet and drill plate.

Using the pilot holes, enlarged to a diameter of 1 inch, affix the drill bushings to the master part, next into the drill plate, clamp, and cast sufficient plastic around the bushings to bend them to the drill plate. Disassemble the bushings from the master part and finish as described in the preceding method.

It should be understood here that plastics are not regarded as a cure-all, and that one plastic cannot do all types of jobs. Plastics as a whole have their limitations; much depends upon the tool itself and the work that it is expected to do. Much thought has been given by Lockheed and Vega engineers to the various types of tools and even to the different tools within the types. Designs for proposed plastic tools have been scrutinized closely. Personnel has had to



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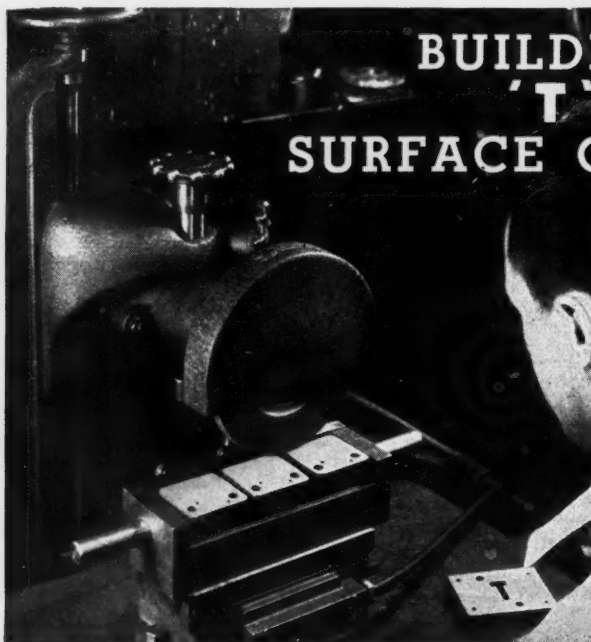
Vega Sheet Metal Department Operator Inspects Completed Part after It has been Formed under Hydro-press, Using Thermosetting Plastic Die

be trained not only in the making of the tools, but also to determine their adaptability and the choice of the various compounds for the different applications.

Plastic exponents at Lockheed and Vega have been gratified with the

reception given plastic tools, which seems due partially to the psychological effect of their attractive appearance. The men who use them make a definite effort to take care of them, consequently reworks due to misuse have been exceedingly small. The tools are also popular because of their light weight and ease of handling.

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Choose the burs of a manufacturer who can be depended on for proper bur *design and quality control*. Beware cut-rate imitations; "all burs look alike" . . . but they perform *far* differently. Keep burs *sharp* . . . return them to the manufacturer *often* for resharpener.

Pratt & Whitney pioneered aircraft burs . . . works closely with the large aluminum makers and fabricators . . . makes burs of every kind for every job. P&W engineers will help you solve any burring problem . . . no charge or obligation. Kellerflex Sales Department.

Company, who, after months of experimentation, developed the so-called "acoustic fence." It is said that the fence fills protection requirements so completely that it cannot be defeated. Even the inventor's efforts are thwarted in trying to climb or jump over, dig under, or saw or cut through a fence that has been equipped with the super-sensitive detector ears.

When a fence has been so equipped, the sound of approaching footsteps, or the chirruping of a bird on the fence, or even the sigh of the wind can be heard. The acoustic fence amplifies the sounds and passes them on to guards who are on the alert at a central control panel, where the alarm signal and the flashing of a red light tells just where along the miles of fence an intruder is attempting illegal entry.

For obvious reasons it cannot be expected that the Du Pont Company, who has turned the manufacturing rights over to Automatic Alarms, Inc., Youngstown, Ohio, will reveal exactly

how the acoustic fence maintains its slumberless, bribeless, attack-proof watch. It must be sufficient to explain that the principle upon which it operates is new, and that it does not employ microphones or other standard type of equipment.

Like the American Indian's custom of holding his ear to the ground to detect faint vibration of footsteps, so the fence with ears listens constantly. Now and then a dog or rabbit comes in contact with the fence—and off goes a false alarm.

Before the inventors began work on this automatic fence alarm, they followed usual practice by examining the virtues and deficiencies of current systems, at the same time listing the requirements which a 100 per cent efficient fence protection must meet. In general they found that a factory fence is usually lighted in one way or another and kept more or less under constant observation by fixed guards or road patrols. The general system of protection may fail, how-

Plant Guards Race to a Waiting Patrol Car the Instant a Saboteur Attempts to Climb the Plant Fence, Tries to Dig Under, or in Any Way Tamper with the Barrier.



ARMY

NAVY

VAN NORMAN WINS

ARMY and NAVY STARS

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**ACKNOWLEDGING THE AWARD TO HIS COMPANY
THE ARMY AND NAVY STAR, VAN NORMAN PRESIDENT
JAMES Y. SCOTT SAID IN PART:**

... this flag is more than just a flag. It symbolizes the tie that today exists between the fighting men of our Army and Navy and the fighting men and women of our labor battalion. It is a symbol of a new, greater spirit ... of unity, of devotion, of loyalty and determination in the cause of victory which we must and shall have, and a unity of thought between all sections of our people in serving their country."

This burgee was recently raised over the Van Norman plant in recognition of the company's record in producing milling machines and oscillating radius grinders for war-production plants, and automotive service machines for the armed forces.

To the last man and woman now wearing the Star button, Van Norman regards this insignia as a challenge for the future ... to top the highest former levels of production. And this challenge will be met ... for Van Norman will keep on earning the Army and Navy Star every hour of every day, until Victory is final and complete.

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.



RUTHMAN
GUSHER
COOLANT PUMPS

UP PRODUCTION

Gusher Pumps save time. No priming. They have split-second control. Provide a copious, steady, dependable flow of coolant. Full ball-bearing design. Other exclusive features to help you "up" production.



*Baby
Gusher*

P3 Baby Gusher Pumps are available in external right or left discharge models, flange-mounted and immersed models.

Pat. and Pats. Pend.

**Write for engineering data
and specifications.**

THE RUTHMAN MACHINERY CO.
1817 READING ROAD, CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

ever, when (1) lights are extinguished for blackout purposes, (2) bad weather, such as fog, rain or snow interferes with vision, (3) guards are asleep, inattentive, or absent from their posts.


A human factor of some consequence is the fact that vision is dulled in continuously looking along an uneventful illuminated fence. In



Plant Guard Reporting "All's Well" Via a Super-Detector on the Acoustic Fence. The Sensitive Ear Picks up the Slightest Vibration and Flashes an Automatic Alarm to the Central Guard Station. Though the Guard Shown here is Speaking, the Report is Usually Made by Tapping in Code

other words, it is hard for a man to remain keenly alert in a fixed post where, hour after hour or day after day, nothing unusual may happen.

For these reasons, it is highly desirable to apply a supplementary device which will give a definite alarm when an attempt is made to pass under, through, or over a fence, thus drawing attention. The general requirements for such a device are as follows:



**WHERE WILL YOU FIND
FLEXIBLE METAL HOSE
NEXT!**

American Flexible Everdur® Metal Hose (installed in 1939) acts as conduit for cables in this sewage disposal plant...turning corners as easy as the cable itself...and providing the corrosion resistance so essential in sewage installations.

Instead of carrying oil, steam, gas or water, it "convoys" an electrical cable through the corrosion laden sub-level of a large sewage disposal plant.

Perhaps the most intriguing angle of flexible metal hose and tubing is its seemingly endless range of application—an unusual adaptability traceable to the variety of constructions in which we have made the product available. Using practically any workable metal, we can build flexible metal hose or tubing for anything from a simple oil can spout to a high pres-

sure, *seamless* hydraulic line that can be flexed millions of times without breaking—a line that will give you the flexibility of garden hose, the dependability of metal, and the *strength of rigid pipe!* • Could some type of this hose or tubing be the "missing link" you have been looking for? Whether you need a flexible connector for misaligned or moving parts, for isolating vibration, for conveying air, water, oil, steam or fuel, you'll likely find we have a type of flexible metal hose or tubing that will do the job more capably. *Send for these fact-laden publications: "Design for Industry" and "Miracle in Metal."*



42187A
*Trademark Reg. U. S. Pat. Off.



American Metal Hose

AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn. • *Subsidiary of Anaconda Copper Mining Company*
In Canada: Anaconda American Brass Ltd., New Toronto, Ontario

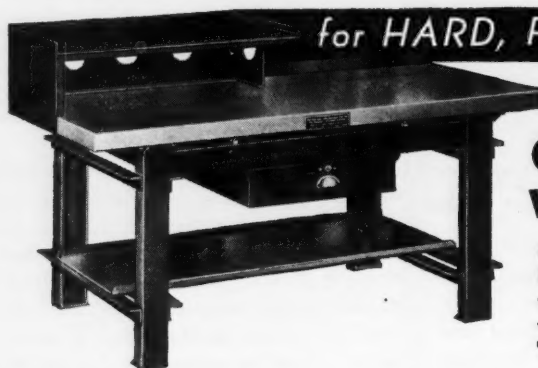
(a) A positive signal should result from any attempt to pass over, under, or through the fence, or from any attempt to tamper with the device. (b) It should be suitable for outdoor operation in all climates and in all types of weather. (c) Operation must be sustained when normal power sources fail. (d) The equipment must be substantial and suitable for sustained 24-hour operation with a minimum of maintenance. (e) It must be dependable and free from erratic operation. (f) It must not be subject to defeat by technically-qualified persons. (g) It must be capable of operation and maintenance without the possibility of personal hazard. (h) Operation of the device should offer the maximum opportunity to apprehend the intruder before he becomes aware that he has been detected. (i) It must be adaptable to fences of any length over either flat or rolling, or over rough or

smooth ground (j) It must be capable of operation with a minimum number of attendants. (k) The schematic features must be flexible enough to meet the requirements of particular applications and be coordinated with the other protective features in the plant.

The acoustic fence is said to meet all of the requirements listed above.

Wm. J. Doyle, Vice President of Automatic Alarms, Inc., explains "The device takes advantage of the fact that most industrial fences are all metal or of substantial wood construction. If a continuous wire fence or substantial wood fence is disturbed by even an exceedingly small impact, mechanical vibrations will pass from the point of the disturbance and travel along the fence for an indefinite distance.

"Impact upon the ground will start vibrations in the ground which pass to the fence and thence along the



for **HARD, FAST WORKERS**

It's a **CHALLENGE WORK BENCH**

Cast Iron Top... Tool Box
Shelf... Leveling Screws
under table... Steel Drawer
with lock... Four Sizes —
Three Styles.

Challenge Work Benches are built to remain rigid under heavy pounding, shocks, and pressure. The top is carefully planed with all four sides at exact right angles. Underside is heavily ribbed.

The legs are firmly braced, the braces being high enough to permit the use of a standard lift truck. Write for prices and details; also data on other Challenge Precision Equipment today!

420

**THE CHALLENGE MACHINERY CO., GRAND HAVEN,
MICHIGAN**

Douglas

10" STROKE SLOTTER

for Precision

Swiveling ram head
and tool holder, auto-
matic circular table
and independent
automatic feeds in all
directions.



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by Large Scale Production

DOUGLAS MACHINERY CO. INC.
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THE 1st
REALLY HIGH-SPEED GRINDER
WAS
KIPP^{air} GRINDER



NOW THE NEW MODEL
H
KIPP^{air} GRINDER

Madison-Kipp tool-makers originated the first really high speed grinder. They know a great deal about the practical side of grinder design and grinder usage. They think the new Model H is the best all around off-hand tool they have ever tried and we are sure you will agree with them. It's fast (50,000 R.P.M.), more powerful, and has a handier grip. If you are doing priority work, Order Today!

Please attach preference rating certificate with order.

29⁷⁵

MADISON-KIPP CORPORATION
 208 Waubesa Street, Madison, Wisconsin, U. S. A.

fence for considerable distances. It is, therefore, possible to place a vibration pick-up against a member of the fence and with suitable amplifying equipment obtain audible registration of vibrations set up in the fence at remote points."

In actual practice, an especially-developed magnetic pick-up of weather-proof construction is attached to the fence at intervals of 1,000 feet. This results in an operating range of 500 feet on each side of the pick-up, which is about one-third the maximum possible range.

Where guard towers are situated along the fence at intervals of 800 to 3,000 feet, it is only necessary to have pick-ups between guard towers. A loud speaker enables the guard to hear and usually to identify the nature of the disturbance to the fence.

This system enables the guard to hear any disturbance along the fence and gives a visual indication that a disturbance has occurred, while the alarm bell wakes the guard up if he is asleep or inattentive. It also serves as an alarm that the guard is away from the post when the disturbance occurs.

The performance of the equipment is definitely predictable. It is extremely sensitive, is protected from tampering by the guards themselves, cannot be put out of action by external tampering, and offers the necessary flexibility to meet the requirements of particular installations. Should the wires be cut, instead of "going dead," the system sounds an alarm which cannot be shut off until the break has been repaired.

Visibility is often zero along the miles of fence surrounding America's great war plants. Nevertheless, where the acoustic fence is in service the saboteur's chance of success is also zero. It stands as good a watch in fog, blackout, darkness or storm as could be maintained by guards standing elbow to elbow.

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NICHOLSON WALL CHART

FILE NO.	FILE TYPE	FILE SIZE	FILE WEIGHT
1	1/2" FILE	1/2" x 1/2" x 1/2"	1.0
2	3/4" FILE	3/4" x 3/4" x 3/4"	1.5
3	1" FILE	1" x 1" x 1"	2.0
4	1 1/4" FILE	1 1/4" x 1 1/4" x 1 1/4"	3.0
5	1 1/2" FILE	1 1/2" x 1 1/2" x 1 1/2"	4.0
6	1 3/4" FILE	1 3/4" x 1 3/4" x 1 3/4"	5.0
7	2" FILE	2" x 2" x 2"	6.0
8	2 1/4" FILE	2 1/4" x 2 1/4" x 2 1/4"	8.0
9	2 1/2" FILE	2 1/2" x 2 1/2" x 2 1/2"	10.0
10	2 3/4" FILE	2 3/4" x 2 3/4" x 2 3/4"	12.0
11	3" FILE	3" x 3" x 3"	15.0
12	3 1/4" FILE	3 1/4" x 3 1/4" x 3 1/4"	18.0
13	3 1/2" FILE	3 1/2" x 3 1/2" x 3 1/2"	20.0
14	3 3/4" FILE	3 3/4" x 3 3/4" x 3 3/4"	22.0
15	4" FILE	4" x 4" x 4"	25.0
16	4 1/4" FILE	4 1/4" x 4 1/4" x 4 1/4"	30.0
17	4 1/2" FILE	4 1/2" x 4 1/2" x 4 1/2"	35.0
18	4 3/4" FILE	4 3/4" x 4 3/4" x 4 3/4"	40.0
19	5" FILE	5" x 5" x 5"	45.0
20	5 1/4" FILE	5 1/4" x 5 1/4" x 5 1/4"	50.0
21	5 1/2" FILE	5 1/2" x 5 1/2" x 5 1/2"	55.0
22	5 3/4" FILE	5 3/4" x 5 3/4" x 5 3/4"	60.0
23	6" FILE	6" x 6" x 6"	65.0
24	6 1/4" FILE	6 1/4" x 6 1/4" x 6 1/4"	70.0
25	6 1/2" FILE	6 1/2" x 6 1/2" x 6 1/2"	75.0
26	6 3/4" FILE	6 3/4" x 6 3/4" x 6 3/4"	80.0
27	7" FILE	7" x 7" x 7"	85.0
28	7 1/4" FILE	7 1/4" x 7 1/4" x 7 1/4"	90.0
29	7 1/2" FILE	7 1/2" x 7 1/2" x 7 1/2"	95.0
30	7 3/4" FILE	7 3/4" x 7 3/4" x 7 3/4"	100.0
31	8" FILE	8" x 8" x 8"	105.0
32	8 1/4" FILE	8 1/4" x 8 1/4" x 8 1/4"	110.0
33	8 1/2" FILE	8 1/2" x 8 1/2" x 8 1/2"	115.0
34	8 3/4" FILE	8 3/4" x 8 3/4" x 8 3/4"	120.0
35	9" FILE	9" x 9" x 9"	125.0
36	9 1/4" FILE	9 1/4" x 9 1/4" x 9 1/4"	130.0
37	9 1/2" FILE	9 1/2" x 9 1/2" x 9 1/2"	135.0
38	9 3/4" FILE	9 3/4" x 9 3/4" x 9 3/4"	140.0
39	10" FILE	10" x 10" x 10"	145.0
40	10 1/4" FILE	10 1/4" x 10 1/4" x 10 1/4"	150.0
41	10 1/2" FILE	10 1/2" x 10 1/2" x 10 1/2"	155.0
42	10 3/4" FILE	10 3/4" x 10 3/4" x 10 3/4"	160.0
43	11" FILE	11" x 11" x 11"	165.0
44	11 1/4" FILE	11 1/4" x 11 1/4" x 11 1/4"	170.0
45	11 1/2" FILE	11 1/2" x 11 1/2" x 11 1/2"	175.0
46	11 3/4" FILE	11 3/4" x 11 3/4" x 11 3/4"	180.0
47	12" FILE	12" x 12" x 12"	185.0
48	12 1/4" FILE	12 1/4" x 12 1/4" x 12 1/4"	190.0
49	12 1/2" FILE	12 1/2" x 12 1/2" x 12 1/2"	195.0
50	12 3/4" FILE	12 3/4" x 12 3/4" x 12 3/4"	200.0
51	13" FILE	13" x 13" x 13"	205.0
52	13 1/4" FILE	13 1/4" x 13 1/4" x 13 1/4"	210.0
53	13 1/2" FILE	13 1/2" x 13 1/2" x 13 1/2"	215.0
54	13 3/4" FILE	13 3/4" x 13 3/4" x 13 3/4"	220.0
55	14" FILE	14" x 14" x 14"	225.0
56	14 1/4" FILE	14 1/4" x 14 1/4" x 14 1/4"	230.0
57	14 1/2" FILE	14 1/2" x 14 1/2" x 14 1/2"	235.0
58	14 3/4" FILE	14 3/4" x 14 3/4" x 14 3/4"	240.0
59	15" FILE	15" x 15" x 15"	245.0
60	15 1/4" FILE	15 1/4" x 15 1/4" x 15 1/4"	250.0
61	15 1/2" FILE	15 1/2" x 15 1/2" x 15 1/2"	255.0
62	15 3/4" FILE	15 3/4" x 15 3/4" x 15 3/4"	260.0
63	16" FILE	16" x 16" x 16"	265.0
64	16 1/4" FILE	16 1/4" x 16 1/4" x 16 1/4"	270.0
65	16 1/2" FILE	16 1/2" x 16 1/2" x 16 1/2"	275.0
66	16 3/4" FILE	16 3/4" x 16 3/4" x 16 3/4"	280.0
67	17" FILE	17" x 17" x 17"	285.0
68	17 1/4" FILE	17 1/4" x 17 1/4" x 17 1/4"	290.0
69	17 1/2" FILE	17 1/2" x 17 1/2" x 17 1/2"	295.0
70	17 3/4" FILE	17 3/4" x 17 3/4" x 17 3/4"	300.0
71	18" FILE	18" x 18" x 18"	305.0
72	18 1/4" FILE	18 1/4" x 18 1/4" x 18 1/4"	310.0
73	18 1/2" FILE	18 1/2" x 18 1/2" x 18 1/2"	315.0
74	18 3/4" FILE	18 3/4" x 18 3/4" x 18 3/4"	320.0
75	19" FILE	19" x 19" x 19"	325.0
76	19 1/4" FILE	19 1/4" x 19 1/4" x 19 1/4"	330.0
77	19 1/2" FILE	19 1/2" x 19 1/2" x 19 1/2"	335.0
78	19 3/4" FILE	19 3/4" x 19 3/4" x 19 3/4"	340.0
79	20" FILE	20" x 20" x 20"	345.0
80	20 1/4" FILE	20 1/4" x 20 1/4" x 20 1/4"	350.0
81	20 1/2" FILE	20 1/2" x 20 1/2" x 20 1/2"	355.0
82	20 3/4" FILE	20 3/4" x 20 3/4" x 20 3/4"	360.0
83	21" FILE	21" x 21" x 21"	365.0
84	21 1/4" FILE	21 1/4" x 21 1/4" x 21 1/4"	370.0
85	21 1/2" FILE	21 1/2" x 21 1/2" x 21 1/2"	375.0
86	21 3/4" FILE	21 3/4" x 21 3/4" x 21 3/4"	380.0
87	22" FILE	22" x 22" x 22"	385.0
88	22 1/4" FILE	22 1/4" x 22 1/4" x 22 1/4"	390.0
89	22 1/2" FILE	22 1/2" x 22 1/2" x 22 1/2"	395.0
90	22 3/4" FILE	22 3/4" x 22 3/4" x 22 3/4"	400.0
91	23" FILE	23" x 23" x 23"	405.0
92	23 1/4" FILE	23 1/4" x 23 1/4" x 23 1/4"	410.0
93	23 1/2" FILE	23 1/2" x 23 1/2" x 23 1/2"	415.0
94	23 3/4" FILE	23 3/4" x 23 3/4" x 23 3/4"	420.0
95	24" FILE	24" x 24" x 24"	425.0
96	24 1/4" FILE	24 1/4" x 24 1/4" x 24 1/4"	430.0
97	24 1/2" FILE	24 1/2" x 24 1/2" x 24 1/2"	435.0
98	24 3/4" FILE	24 3/4" x 24 3/4" x 24 3/4"	440.0
99	25" FILE	25" x 25" x 25"	445.0
100	25 1/4" FILE	25 1/4" x 25 1/4" x 25 1/4"	450.0
101	25 1/2" FILE	25 1/2" x 25 1/2" x 25 1/2"	455.0
102	25 3/4" FILE	25 3/4" x 25 3/4" x 25 3/4"	460.0
103	26" FILE	26" x 26" x 26"	465.0
104	26 1/4" FILE	26 1/4" x 26 1/4" x 26 1/4"	470.0
105	26 1/2" FILE	26 1/2" x 26 1/2" x 26 1/2"	475.0
106	26 3/4" FILE	26 3/4" x 26 3/4" x 26 3/4"	480.0
107	27" FILE	27" x 27" x 27"	485.0
108	27 1/4" FILE	27 1/4" x 27 1/4" x 27 1/4"	490.0
109	27 1/2" FILE	27 1/2" x 27 1/2" x 27 1/2"	495.0
110	27 3/4" FILE	27 3/4" x 27 3/4" x 27 3/4"	500.0
111	28" FILE	28" x 28" x 28"	505.0
112	28 1/4" FILE	28 1/4" x 28 1/4" x 28 1/4"	510.0
113	28 1/2" FILE	28 1/2" x 28 1/2" x 28 1/2"	515.0
114	28 3/4" FILE	28 3/4" x 28 3/4" x 28 3/4"	520.0
115	29" FILE	29" x 29" x 29"	525.0
116	29 1/4" FILE	29 1/4" x 29 1/4" x 29 1/4"	530.0
117	29 1/2" FILE	29 1/2" x 29 1/2" x 29 1/2"	535.0
118	29 3/4" FILE	29 3/4" x 29 3/4" x 29 3/4"	540.0
119	30" FILE	30" x 30" x 30"	545.0
120	30 1/4" FILE	30 1/4" x 30 1/4" x 30 1/4"	550.0
121	30 1/2" FILE	30 1/2" x 30 1/2" x 30 1/2"	555.0
122	30 3/4" FILE	30 3/4" x 30 3/4" x 30 3/4"	560.0
123	31" FILE	31" x 31" x 31"	565.0
124	31 1/4" FILE	31 1/4" x 31 1/4" x 31 1/4"	570.0
125	31 1/2" FILE	31 1/2" x 31 1/2" x 31 1/2"	575.0
126	31 3/4" FILE	31 3/4" x 31 3/4" x 31 3/4"	580.0
127	32" FILE	32" x 32" x 32"	585.0
128	32 1/4" FILE	32 1/4" x 32 1/4" x 32 1/4"	590.0
129	32 1/2" FILE	32 1/2" x 32 1/2" x 32 1/2"	595.0
130	32 3/4" FILE	32 3/4" x 32 3/4" x 32 3/4"	600.0
131	33" FILE	33" x 33" x 33"	605.0
132	33 1/4" FILE	33 1/4" x 33 1/4" x 33 1/4"	610.0
133	33 1/2" FILE	33 1/2" x 33 1/2" x 33 1/2"	615.0
134	33 3/4" FILE	33 3/4" x 33 3/4" x 33 3/4"	620.0
135	34" FILE	34" x 34" x 34"	625.0
136	34 1/4" FILE	34 1/4" x 34 1/4" x 34 1/4"	630.0
137	34 1/2" FILE	34 1/2" x 34 1/2" x 34 1/2"	635.0
138	34 3/4" FILE	34 3/4" x 34 3/4" x 34 3/4"	640.0
139	35" FILE	35" x 35" x 35"	645.0
140	35 1/4" FILE	35 1/4" x 35 1/4" x 35 1/4"	650.0
141	35 1/2" FILE	35 1/2" x 35 1/2" x 35 1/2"	655.0
142	35 3/4" FILE	35 3/4" x 35 3/4" x 35 3/4"	660.0
143	36" FILE	36" x 36" x 36"	665.0
144	36 1/4" FILE	36 1/4" x 36 1/4" x 36 1/4"	670.0
145	36 1/2" FILE	36 1/2" x 36 1/2" x 36 1/2"	675.0
146	36 3/4" FILE	36 3/4" x 36 3/4" x 36 3/4"	680.0
147	37" FILE	37" x 37" x 37"	685.0
148	37 1/4" FILE	37 1/4" x 37 1/4" x 37 1/4"	690.0
149	37 1/2" FILE	37 1/2" x 37 1/2" x 37 1/2"	695.0
150	37 3/4" FILE	37 3/4" x 37 3/4" x 37 3/4"	700.0
151	38" FILE	38" x 38" x 38"	705.0
152	38 1/4" FILE	38 1/4" x 38 1/4" x 38 1/4"	710.0
153	38 1/2" FILE	38 1/2" x 38 1/2" x 38 1/2"	715.0
154	38 3/4" FILE	38 3/4" x 38 3/4" x 38 3/4"	720.0
155	39" FILE	39" x 39" x 39"	725.0
156	39 1/4" FILE	39 1/4" x 39 1/4" x 39 1/4"	730.0
157	39 1/2" FILE	39 1/2" x 39 1/2" x 39 1/2"	735.0
158	39 3/4" FILE	39 3/4" x 39 3/4" x 39 3/4"	740.0
159	40" FILE	40" x 40" x 40"	745.0
160	40 1/4" FILE	40 1/4" x 40 1/4" x 40 1/4"	750.0
161	40 1/2" FILE	40 1/2" x 40 1/2" x 40 1/2"	755.0
162	40 3/4" FILE	40 3/4" x 40 3/4" x 40 3/4"	760.0
163	41" FILE	41" x 41" x 41"	765.0
164	41 1/4" FILE	41 1/4" x 41 1/4" x 41 1/4"	770.0
165	41 1/2" FILE	41 1/2" x 41 1/2" x 41 1/2"	775.0
166	41 3/4" FILE	41 3/4" x 41 3/4" x 41 3/4"	780.0
167	42" FILE	42" x 42" x 42"	785.0
168	42 1/4" FILE	42 1/4" x 42 1/4" x 42 1/4"	790.0
169	42 1/2" FILE	42 1/2" x 42 1/2" x 42 1/2"	795.0
170	42 3/4" FILE	42 3/4" x 42 3/4" x 42 3/4"	800.0
171	43" FILE	43" x 43" x 43"	805.0
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174	43 3/4" FILE	43 3/4" x 43 3/4" x 43 3/4"	820.0
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178	44 3/4" FILE	44 3/4" x 44 3/4" x 44 3/4"	840.0
179	45" FILE	45" x 45" x 45"	845.0
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182	45 3/4" FILE	45 3/4" x 45 3/4" x 45 3/4"	860.0
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200	50 1/4" FILE	50 1/4" x 50 1/4" x 50 1/4"	950.0
201	50 1/2" FILE	5	

Panzers in Peaceful Valleys

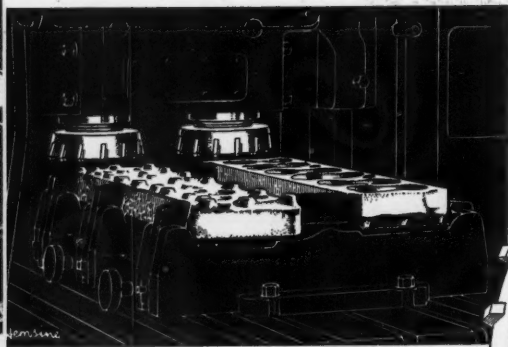
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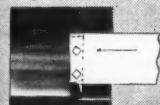
A Few Applications of Standard Vascoloy-Ramet Carbide Tools



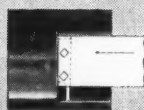
Ordinary Turning
Styles 11 and 12



Ordinary Facing
Style 12



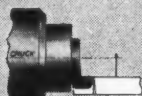
Boring
Style 12



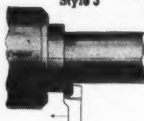
Boring to a Square
Shoulder
Style 6



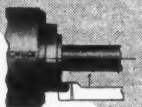
Turning to a Square
Shoulder
Style 3



Facing to a Square
Shoulder
Style 6



Turning Close to
Chuck
Style 1



Facing
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That Occasional Spring

When a spring is needed, it needs to be right. In this article the author presents the fundamental considerations in the design and manufacture of a spring—and presents it in a practical manner.

By L. KASPER

TO produce a helical spring which will support the required load, which will function without failure through a satisfactory number of cycles, and which will fit into the allotted space is no mean task. The art of successful spring making is one which requires not only a wealth of information, but which depends greatly upon the experience and sound judgment of the designer.

Two helical springs may be almost identical in appearance, but will differ widely in performance; conversely, two springs may be radically different as to length, diameter and diameter of material, yet may perform the same operation with equal satisfaction.

When the average mechanic is required to form a spring, he accepts the job with no misgivings, as he feels that he is not expected to meet the requirements in the first attempt; to him it is a trial and error job which will draw no criticism in case of failure. Be that as it may, it still remains that any knowledge which may be utilized as a basis for trial will greatly reduce the number of trials required before success is attained.

The commercial spring maker who produces springs by the thousands is

not beyond failure, as the requirements of spring performance are so diversified that knowledge and experience cannot cover them all. However, his experience enables him to produce springs with a much smaller percentage of failures than is the lot of the mechanic to whom a helical spring is little more than a piece of crooked wire which, with the aid of Providence, may perform with a reasonable degree of satisfaction.

It is not the purpose of this discussion to burden the reader with a number of complicated formulas or intricate calculations, but rather to discuss, in a general way, points which should enable the occasional spring maker to reduce the trial and error period. To the commercial spring maker, the information contained in the following paragraphs may appear rudimentary and incomplete; for the occasional spring maker, simplicity has been the objective.

Helical Springs

Helical springs may be made in a variety of shapes and for a variety of purposes, but consideration will be given only to the two most common types; namely, the compression spring and the extension spring of

cylindrical form. As steel is the most widely used spring material, all rules and formulae used in this discussion apply to steel.

Before considering any of the technicalities of spring design, it will be well to consider in a general way the functions of a spring and the performance requirements. The purpose of a spring is practically the same as that of a flywheel; viz., to store energy until such time as it may be released for useful work. Similar to a flywheel, it does not create energy but merely returns that which has been previously expended upon it. A spring lying on the stockroom shelf is nothing more than a crooked piece of wire, but when applied to a movable object, it is capable of resisting the movement of that object and of returning the object to its original position once the resistance has been overcome.

The efficiency with which a spring performs its functions and the length of time it may be expected to continue its performance is governed by a number of points such as the quality of the material from which it is made, the treatment applied to the material in the process of fabrication, the unit volume or sectional dimensions of the material, the diameter and spacing of the coils, and the method of manufacture.

The prime consideration in the manufacture of any spring is the quality of the material. This point becomes especially important when it is considered that a broken spring becomes forever useless. A broken machine part may be welded so as to regain its original or greater strength, but a spring cannot be repaired.

Surface imperfections such as scratches and seams may be the cause of early failure, particularly if the imperfections happen to be on the inside of the coil of the wound spring. Fractures usually start on the inside

of the coil, which is the most highly stressed part, and any imperfections provide starting points for fractures.

Carbon steel is the most satisfactory and widely used spring material, though alloy steels are also used when the requirements are severe. The carbon content of the steel may range between .60 per cent and 1.0 per cent. Small springs are usually made of music wire or hard drawn wire. Music wire is a high grade polished steel wire of .80 per cent to .90 per cent carbon content, and is produced by alternate heat treatments and reductions by cold drawing. It is obtainable in a wide range of standard sizes up to $\frac{1}{8}$ inch diameter.

Hard drawn spring wire contains from .50 per cent to .60 per cent carbon and about 1 per cent manganese. It is also produced by alternate heat treatments and cold reductions which render it tough and springy. Though inferior to music wire in analysis and surface finish, it will prove satisfactory for many applications where the requirements are not severe. Though the cold working of the above materials increases their strength and hardness, it also introduces high internal stresses which may result in early failure if used in the cold worked conditions, especially on severe applications. For this reason, springs made of these materials are usually given a final heat treatment after coiling. This subject will be discussed later.

Uniform hardness and uniform diameter of the material are essential if uniform results are to be expected, which is merely another way of recommending that the highest grade of material be used.

In the design of any spring, the type of service for which it is to be used requires careful consideration. Whether that service may be classed as light or severe is a matter of

judgment based on experience and a knowledge of springs in general. The terms "light" and "severe" are relative in the mind of the designer, and therefore may be very indefinite. However, in a comparative analysis of any type of service, the highest factor of safety consistent with the fulfillment of performance and space requirements is naturally the safest path to follow.

When a spring is to operate infrequently, with little difference between maximum and minimum load or flexure, the service condition may be considered light, and will usually give no trouble. If operating conditions require frequent application of the load, with a high ratio between maximum and minimum, the condition may be considered severe. An automobile engine valve spring is a good example of the latter type.

One of the simplest rules—and the one most frequently violated by the occasional spring maker—is that governing spring index. The term "spring index" means the ratio of the mean coil diameter to the diameter of the

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material, or —. A too common prac-

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tice when greater stiffness is required is to increase the wire diameter or to decrease the mean coil diameter, or both, without considering the value of the index ratio. Early failure can be the only result of this practice.

The most satisfactory index lies between 4 and 10. Under exceptional conditions, an index of 3 may give fair results, but this should be avoided if possible. It is well known that most materials work-harden when subjected to cold forming of any kind, thereby introducing high internal stresses. It is clear that a spring the design of which is based on a small index will be subjected to a greater amount of cold working than a spring wound to a larger index. In other words, the smaller the coil, the

sharper is the bend and the greater is the tendency to induce localized residual stresses. The maximum stress occurs on the inside of the coil which is the starting point for most fractures.

Pitch greatly influences the strength of a compression spring; the fewer the coils, the stronger or stiffer will be the spring. However, a spring with a helix angle between 7 and 15 degrees will give the best general results. It is advisable to use as many coils as the space limitations and the load requirements will permit, as the greater the volume of material in the given load and space requirements, the less will be the change in pressure within its range of deflection.

Extension springs are generally designed with hooks or loops at the ends, for attaching. This introduces a condition of fatigue which does not exist in compression springs, in that the loops are subjected to bending stresses which may result in early failure. There is greater stress in the hooks and loops than in the rest of the spring, being greatest at the point where the coil is bent to form the hook or loop. For this reason the radius at the loop should be generous and care should be observed to avoid nicking or otherwise damaging the material in forming the bend.

The practice of forming double loops with the thought of preventing breakage is misleading, as it does not in any way reduce the stress in the bend but merely provides a broader wearing surface at the point where friction on the fastening may occur.

Springs coiled from steel in its annealed condition and then hardened after coiling should be given the usual heat treatment for that type of steel, applying a long time draw after the quench. Due to the shape of a helical spring and the stresses set up in the material in forming it to that shape, and in spite of the closest control of the hardening proc-

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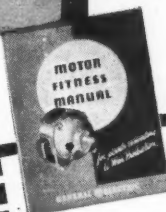
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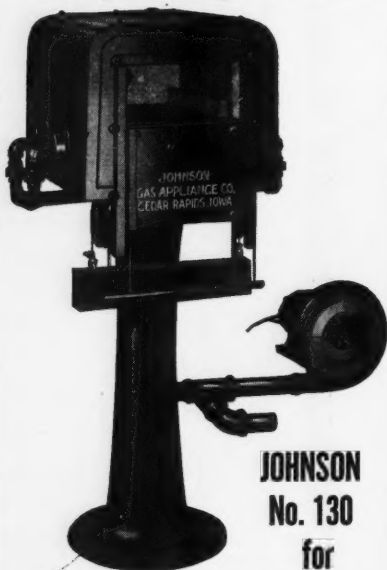
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esses, some distortion will take place. The result will be some lack of uniformity, not only between different springs, but to some extent in different sections of the same spring. Except in very delicate applications, the variations may be so slight as to be considered negligible; nevertheless, music wire and hard drawn wire are generally used in order to eliminate the hardening process after coiling.

The use of cold drawn wire, in spite of the advantages gained by its use, introduces a condition which is found in all materials to some degree, but which is accentuated by cold working. Cold working of any kind hardens and strengthens or increases the stiffness of any metal. In a spring made of cold drawn wire, the drawing process in itself imparts a certain amount of stiffness to the material which is further increased by the cold working applied by the coiling process. These cold working operations produce internal stresses in the spring which decrease the fatigue resistance and may result in early fracture.

Immediately after any cold working operation a natural process of aging begins to affect the stiffness of the material. By this process, the material tends to gradually reach a condition of stability, so that a coiled spring will be gradually reduced in stiffness with the passage of time alone, until it reaches a condition in which further changes become so slight over a long period of time as to be negligible.

In industrial operations it is impossible to permit the elapse of a sufficient period of time to allow the natural aging process to influence the condition to an extent as to be of any practical value, therefore a process which will increase the aging speed is desirable. The simplest method of relieving internal stresses is to subject the spring to elevated temperatures.

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recrystallization point of the material, the internal stresses are dissipated rapidly; at a point slightly below this temperature there is a sharp increase in the necessary time element. Obviously, the application of a temperature sufficiently high to rapidly relieve the stresses would destroy other desirable and necessary properties of the material. Therefore, it is necessary to compromise between a rapid, high-temperature treatment and a lower temperature treatment with an increase in the time element.

The most economical treatment will be at a temperature as close as possible to the annealing point of the material without too great a sacrifice of the other desirable properties. Experience has shown that for all practical purposes, exposure to a temperature of 400 degrees F. for a period of 5 hours will give the best general results.

There is some difference of opinion

as to the superiority of a heated oil bath over heated air as a means of applying the temperature; theoretically there should be no difference in effect, except that there may be a possibility of a more uniform temperature throughout a body of oil than it may be possible to obtain in a body of air, regardless of how thoroughly the latter may be agitated.

In order to reduce the time element necessary for stress relief, a practice which is sometimes followed consists in winding the spring to a greater length than is required, at a coarser pitch, and then loading the spring until the elastic limit of the material is exceeded. This results in a permanent set with correspondingly decreased length and stiffness which bears all the earmarks of the natural or elevated temperature aging. But it is obvious that service requirements cannot be met in this manner, as this process is but another cold working

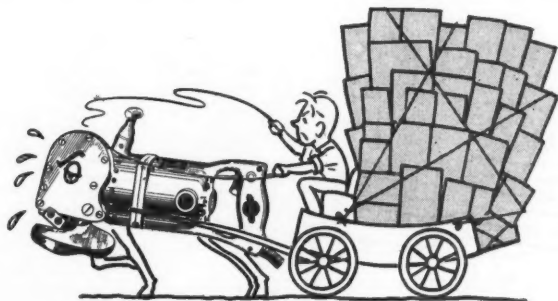


PRIORITY IN EXPERIENCE

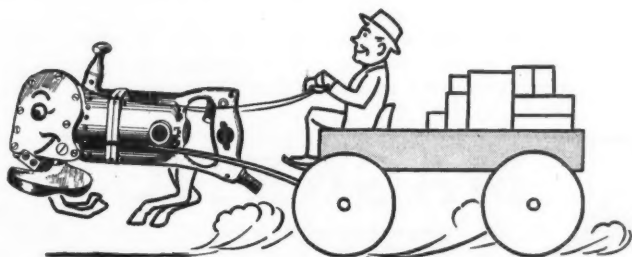
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operation, and, logically, stresses cannot be relieved by the addition of other stresses.

Before entering into any of the

which resists extension or increase of length. This spring is usually wound without spaces between the coils, though this is not a requirement.

The ends of an extension spring may be prepared in a variety of ways, the most common of which involves the use of eyes and loops, as illustrated in Fig. 1, the eyes or loops may be in line, opposite, at right angles, or in any intermediate position.

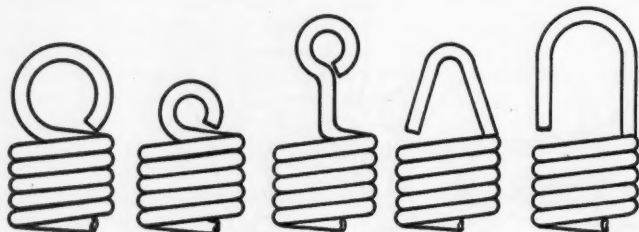


Fig. 1—Some Typical Extension Spring Ends

calculations of spring design, it is necessary to understand the meanings of the terms used. A compression spring is one which resists compression, or shortening of its length. It is always wound with spaced coils, otherwise its length could not be shortened. An extension spring is one

The ends of a compression spring may be any one of four kinds; namely, plain, squared, ground, or squared and ground, as illustrated in Fig. 2. The ground and squared ends are best for exacting purposes, as better seats

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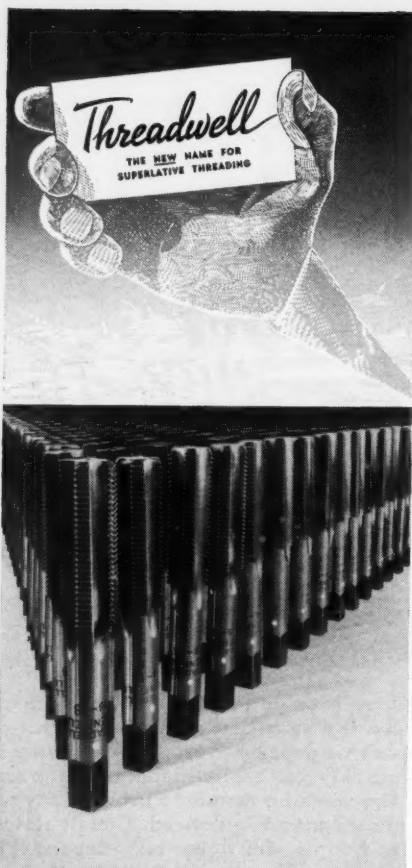
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are provided to serve as supporting points, thereby reducing the tendency to buckle which is characteristic of all compression springs.

In all calculations only those coils which are considered active are included. The term "active coils" is self-explanatory, and includes only those coils which are actively engaged in supporting the load. In an extension spring, all the coils except those forming the loops are considered active. In a compression spring

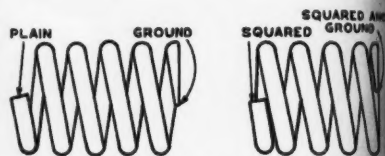


Fig. 2—Compression Spring Ends

with plain ends, all the coils are considered active.

If the ends are ground, one-half coil on each end is considered inactive, therefore the number of active coils will be the total number of coils minus one. If the ends are squared, or squared and ground, one coil on each end is considered inactive, the number of active coils being the total number of coils minus two.

The deflection of a spring is the distance that a compression spring will shorten, or that an extension spring will lengthen, on the application of the load. The amount of deflection is directly proportional to the load up to the point where the elastic limit of the material is reached. The maximum deflection is the greatest amount of change in the length of a spring which may be safely allowed.

The free length of a compression spring is its length without load, or the length to which it will expand on removal of the load. The free length of an extension spring is its length when not affected by load; if close

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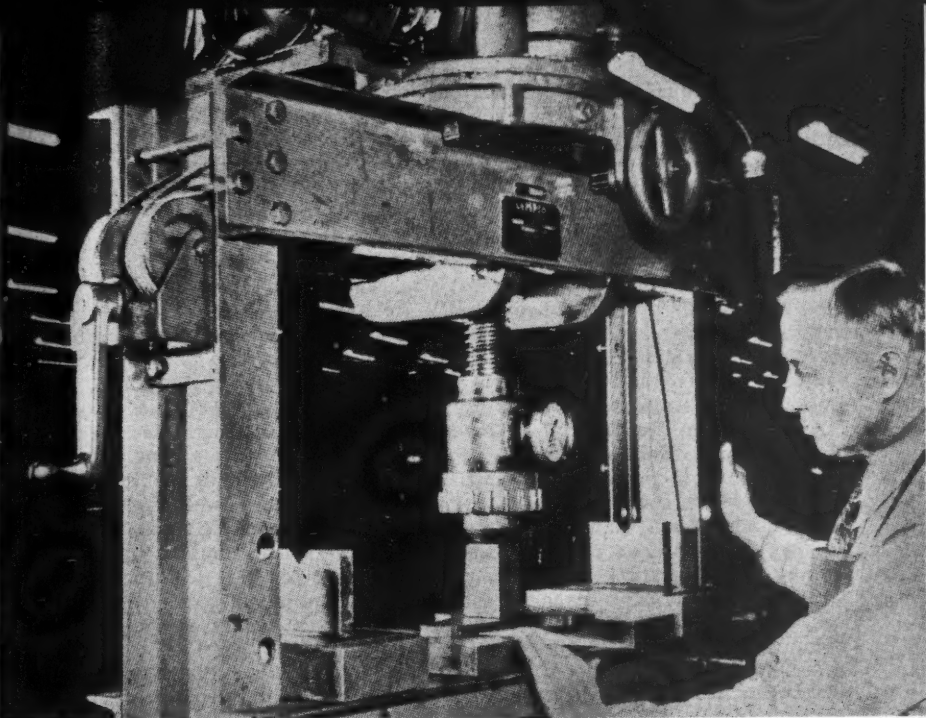
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LEMPCO

POWER+PLUS PRESSES HYDRAULIC ELECTRIC

40 and 60 ton models. Choice of ram travel and speeds. Simple, sturdy, efficient! Many exclusive features.

\$215 and \$385

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GENTLEMEN: Tell me plant nearest me where I may see a LEMPCO Press in operation.

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ADDRESS
CITY STATE

wound, it is equal to the product of the wire diameter and the number of active coils plus one wire diameter.

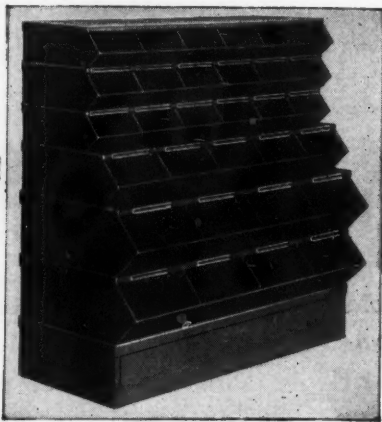
In any length of coiled wire where the coils touch each other, and where there is no change in the end coils, the solid length is equal to the product of the wire diameter and the number of coils plus one wire diameter. If the ends are ground, one-half the wire diameter is ground from each end, therefore the solid length is equal to the product of the wire diameter and the number of coils.

An extension spring that is made by coiling on a mandrel may be provided with what is known as "initial tension," which means that the coils are wound with a tendency to overlap, so that, without the application of any external force, the coils are already under tension, each pressing against the other. This provides an amount of preload which must be overcome before the coils will deflect

on the application of the load.

The amount of the initial tension is gauged by the force necessary to just open the coils, and may vary from zero to 25 per cent of the ultimate load the spring is capable of sustaining. It is possible to vary the amount of initial tension by the method of winding, but it cannot be held uniform.

It is possible to coil a spring with an initial tension equal to the amount of load the spring will hold for one inch of extension. Thus, if a spring will carry 10 pounds per inch of extension, it can be wound to carry 20 pounds for the first inch, and then 10 pounds for each additional inch. This method of winding does not increase the total load, but it does increase the load for the first inch of extension. The initial tension must be considered as a part of the load in any calculations, but after the initial movement it is eliminated.



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STACKBIN sections will give you a Stockroom wherever you want it—quickly and easily as building a sectional bookcase. These patented sectional storage bins nest together without the use of tools—cost you nothing to build, nothing to move. Find out today how STACKBINS can lower YOUR handling costs.

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53 Troy St., Providence, R. I.

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"STACKED AND STILL ACCESSIBLE"

Suggestions for **MORE EFFECTIVE** INSPECTION PRACTICE

1 Establish a definite wear allowance for all fixed size gages, plugs, rings, etc.

2 Check these gages periodically to determine when wear has eliminated this allowance.

3 In final inspection it is better to use an instrument than a fixed size gage when the wear allowance of the gage by the 5-10% rule is established at .0001" or less. Here the human factor is usually important enough to outweigh the effect of the wear allowance and gaging results become questionable.

4 It is ordinarily not best to use a conventional snap gage for the inspection of work having a manufacturing tolerance of .002" or less.

5 Keep plugs and rings oiled when not in use.

6 Be sure that both work and gage are clean before they are brought together.

7 Periodically check your precision gage blocks for wear, against a set of certified blocks. Redesignate them when wear is revealed.

8 In setting a comparator gage be sure that both gage and precision blocks are at the same temperature.

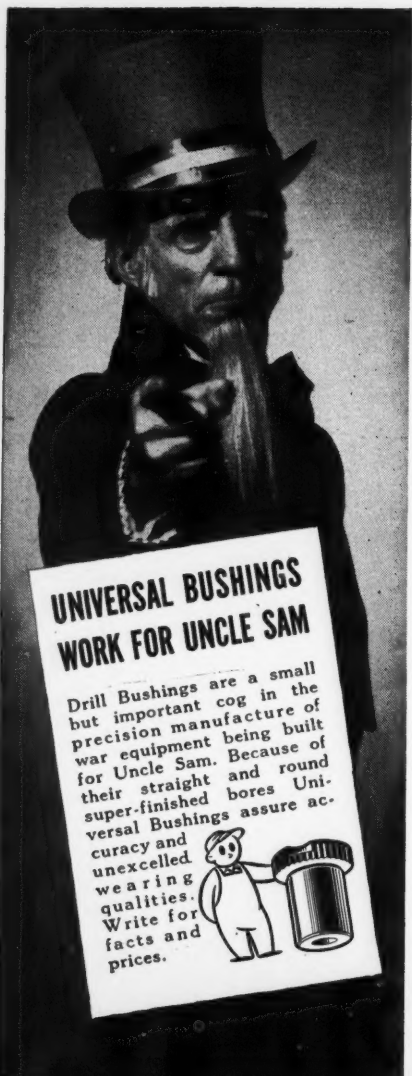
9 It is well to check the calibration of indicating type comparators periodically. If an error is found, it is better to send the comparator back to the factory for recalibration.

10 If you are using Multichek gages insist on the operators handling them smoothly. Work should never be jammed violently into gaging position.

Sheffield Engineers


are authorities on precision inspection. Get their advice on questions relative to gaging and Dimensional Control.





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WORK FOR UNCLE SAM**

Drill Bushings are a small but important cog in the precision manufacture of war equipment being built for Uncle Sam. Because of their straight and round super-finished bores Universal Bushings assure accuracy and unexcelled wearing qualities. Write for facts and prices.



UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH, MICH.

Calculating Spring Values

In calculating spring values, as with any other type of computation, requirements as to accuracy are governed by the application. When extreme accuracy is considered necessary, that accuracy can be attained only by the use of equally accurate figures coupled with the necessary experience to indicate the correct selection of figures.

For average applications, however, extreme accuracy is neither necessary nor desirable, but merely results in a needless expenditure of time and increases the possibility of unsatisfactory results due to the greater risk of error. For this reason, the formulas which follow have been simplified with the thought of increasing their usefulness under average conditions, and therefore may not meet with the approval of the college professor or the stickler for accuracy. Nevertheless, they have been found satisfactory for average applications, which, primarily, is their function.

Formulas for Round Wire

The following formulas apply to round steel wire only, and for both extension and compression springs. The symbols used, and their known values as employed in the solutions are as follows: diameter of wire, $d = .125$; mean radius of coil, $R = .625$; number of active coils, $n = 14$; load applied to spring, $P = 10$ pounds; modulus of torsional elasticity, $G = 12,000,000$; maximum fibre stress, $S = 60,000$ pounds per square inch; deflection per coil, $F = .053$ inch; total deflection of spring, $F_n = .742$ inch; safe carrying capacity of spring, $W = 37$ pounds. The symbols G and S do not appear in the formulas directly, but are used in obtaining the simplified formulas as given. They are mentioned merely to indicate that average values have been employed.

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August, 1942



Removing formed parts from Masonite Dies at Vought-Sikorsky Division, United Aircraft Corporation

AMERICA must produce in a hurry the swarms of new airplanes needed to give the United Nations control of the embattled skies.

Enlisted in this race against time is the new Masonite Die Stock—a semi-plastic material used in the manufacture of dies for forming sheet metal.

With these dies, the forming and blanking of parts are done in *just one operation*. The combination of Masonite Dies, rubber press pads and pressure results in revolutionary savings of time and slashes cost of fabrication.

Only one-sixth the weight of steel, Masonite Die Stock is easily handled by pattern or tool maker—yet has stiffness, strength and durability for production runs.

While its most spectacular success is being demonstrated in the aircraft industry, Masonite Die Stock is also being used by other fabricators of thin gauge metals to do a faster, better job at less cost and effort.

Masonite Die Stock is available in thicknesses of $\frac{1}{4}$ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further details, fill out and mail coupon.

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MASONITE CORPORATION

Dept. MM-8, 111 West Washington Street, Chicago, Ill.

Please send me illustrated literature and complete information about the new Masonite Die Stock.

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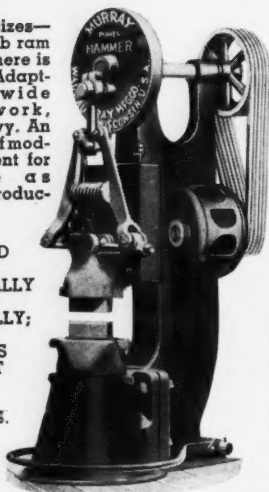
August, 1942

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POWER DRIVEN FORGE HAMMERS

Made in 5 sizes—
25 lb to 500 lb ram
(illustrated here is
250 lb ram) Adapt-
able to a wide
range of work,
light or heavy. An
ideal piece of mod-
ern equipment for
maintenance as
well as produc-
tion work.

OPERATED
EITHER
MECHANICALLY
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ARE NOT
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OR AIR
HAMMERS.



Adjustment for different thicknesses of dies and material is provided—an outstanding Murray feature. Extremely powerful, yet simple in design, and so Flexible in operation Murray Power Driven Forge Hammers can be operated under perfect control, with little effort. Stability is built into them, and this means longer life and less maintenance cost. The ram design is a special feature. The ram is free from any obstruction thereby assuring full vision of the work, which makes possible use of longer guide. Write for details, and ask us about our repair and parts service.

D. J. MURRAY MFG. CO.
Wausau, Wisconsin

Established in 1883. Offices in Principal Cities

above, to determine the deflection, in inches, per coil:

$$F = \frac{PR^3}{187500d^4} = 0.053$$

The total deflection of the spring is equal to the product of the deflection per coil and the number of active coils, or F_n .

To determine the mean radius of the coil:

$$R = \sqrt[3]{\frac{187500Fd^4}{P}} = 0.624$$

To determine the diameter of the wire to be used:

$$d = \sqrt[4]{\frac{PR^3}{187500F}} = 0.125$$

To determine the safe carrying capacity of the spring:

$$W = 11781 \frac{d^3}{R} = 37 \text{ LB.}$$

The above formula serves as a check on the foregoing values; it may be necessary to vary the selected wire diameter or the mean coil radius so that the above value is not exceeded.

To determine the number of active coils, it is necessary to know the solid length, or the length of the spring with the coils touching each other, which is consistent with the previously given rule to provide the greatest possible volume of wire in the spring.

Assuming the spring to be with squared ends, and with a solid length of 2 inches, the number of active coils will be:

$$\frac{2}{0.125} - 2 = 14$$

In a compression spring, the minimum compressed length should be greater than the solid length; if necessary, the number of coils should be reduced to permit some space between the coils when the spring is com-

2,434,000
PERFECT CAP SCREWS
 FROM THESE
RED CUT SUPERIOR
Thread Rolling Dies

5/16" x 18 thread

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 "L" Temper dies used by
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A "not uncommon run" with this remarkable steel!
Says the customer



"TOPS IN TOOL STEELS"

Vanadium-Alloys
STEEL CO. LATROBE, PA.

pressed to its minimum length.

To determine the free length of a spring, the minimum compressed length is added to the total deflection, thus:

$$F_n + 2 = 2.742$$

It may be desirable to determine the loads obtainable with the spring at various compressed lengths. In this case, the load in pounds per inch of deflection, which is known as the rate or gradient of the spring, will be of value. This factor is determined by dividing the load by the total deflection, thus:

$$\frac{P}{F_n} = 18.87 \text{ LB.}$$

In calculating spring values with the above given formulas, it must be borne in mind that they are intended to be used as guides only; some modifications may be necessary to obtain

the desired results. But, by the use of these formulas, the experimental time will be reduced to a minimum. As previously stated, experience is the art of spring making is invaluable, but for the occasional spring maker, who lacks this experience, the use of the above simple rules and formulas will result in a lower percentage of failures.

"Instructions for Users of Kennametal Steel Cutting Carbide Tools." McKennametal Co., 300 Lloyd Ave., Latrobe, Pa., has prepared a 48-page manual of Kennametal Steel Cutting Carbide Tools. Small in size so that it can be easily carried in the pocket for ready reference, the manual contains chapters on Selecting, Designing, Using, Brazing and Grinding Kennametal tools. Complete easy-to-follow instructions point out to the reader exactly how to get the utmost service from all types of Kennametal Steel Cutting Carbide Tools. Copy manual free to interested persons upon request.

SHEAR-CUT HIGH SPEED END MILLS



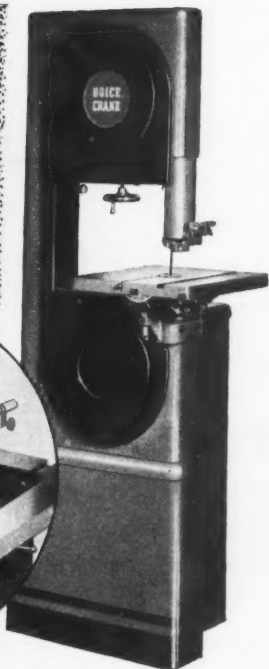
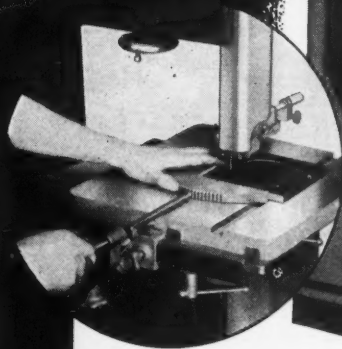
Here's a complete line of
Single and Double End Mills.

They save time and money.
SPECIFY PROGRESSIVE SHEAR-CUT END MILLS.
Write for catalog and prices.

PROGRESSIVE TOOL & CUTTER CO.
2345 WOLCOTT ST. FERNDALE, MICH.

NEW LOW-COST 14" BAND SAW

FOR
PRECISION
CONTOUR
SAWING



It Is Also
An All-Purpose
Cut-Off Machine For

IRON & STEEL
BRASS & COPPER
ALUMINUM & ZINC
WOOD & PLYWOOD
BUILDER'S BOARDS
BRAKE LINING
CASTING SPRUES
ASBESTOS & RUBBER
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PAPER • PLASTICS

Or Other Tough
Industrial Materials

SPECIFICATIONS

Throat depth—13½". Under Guide Clearance—8½". Blades, width—¼" to ¾" wide; length—98". 8-Speed Gear Box Drive—92, 128, 183, 250, 1650, 2420, 3260, 4100 ft. per minute. Micrometer Set Blade Guides with New Type Jaws. Height—67"; Floor Space—27½" x 29"; Weight—365 lbs. Model shown \$214.50, F.O.B. Factory, with ½ h.p., 1 ph. motor. Blade Welder for inside cutting, \$90.

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The Boice-Crane is designed for use anywhere in the plant. Stands the gruelling pace of production line or foundry. Meets exacting toolroom needs.

Makes straight, angular and contour cuts. Beats milling machine and shaper time roughing out dies, cams, punches, and odd-shaped assembly parts.

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BOICE-CRANE CO.
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T-04

TUNGSTEN-TITANIUM CARBIDE

THE NEAREST APPROACH IN TOUGHNESS AND STRENGTH
TO HIGH SPEED STEEL YET DEVELOPED IN A CARBIDE

EASY TO GRIND—Firthite T-04 will take a keen, smooth edge and can be ground to steep rakes and clearances with deep chip-curling grooves.

UNIQUE—Firthite "GRADE T-04" Tungsten-Titanium Carbide is a Firth-Sterling development—the result of years of research. It sets new performance standards. T-04 is especially recommended for heavy duty, interrupted cuts, coarse feeds, etc.

UNIVERSAL IN APPLICATION—Firthite T-04 is the closest known approach to a universal grade of carbide. It approximates high-speed steel in toughness and strength. Production records show that T-04 gives uniformly fine performance in such varied applications as cutting armor plate, roughing softer steels, machining both cast iron and chilled cast iron—also other metals.

WHATEVER you are machining, use FIRTHITE. It's aces! Besides T-04, other grades of Firthite Tungsten-Titanium Carbide are available and will likewise SAVE YOU MONEY. They cover the entire field of Steel Cutting with maximum efficiency. **GRADE TA** is for general use on certain steels.

WILL STAND ABUSE—Firthite T-04 is tough, strong, wear-resistant. It withstands abuse from intermittent cuts, old machines, excessive overhang, inexperienced operators, etc.

GOOD FOR INEXPERIENCED TRAINEES—Because Firthite T-04 does not require extra care in operation, it is the logical choice for training new operators in the use of sintered carbides. It is also ideal for any new application.

CONTAINS TITANIUM—The Titanium ingredient in T-04's composition plays a triple role: (1) converts an otherwise ordinary tungsten-carbide grade into a star performer in cutting steel; (2) lowers the price to you; (3) precludes any possible shortage, since Titanium is the ninth most plentiful mineral and the domestic supply is more than ample for ALL requirements.

GRADE T-16 is for light, rapid finishing of harder steels.

REMEMBER—a pound of Tungsten used in FIRTHITE does many, many times the work of a pound of Tungsten used in high-speed steel.

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CARBIDES FOR COMPLETE
SHOP TOOLING

Firth-Sterling
STEEL COMPANY

OFFICES: INKESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT

YOUR BEST BET

FOR



"Billets to Bullets"

- - In Four Acts

AS industry goes all-out to lick the pants off the Axis, the enemy quakes in the knowledge that we're not kiddin'. Our former "defense" operations have now become "offense" operations in a hurry-up struggle to win the war.

Americans are fighting mad. Already the gigantic power of America's production system loudly is expressing itself on a thousand battle fronts. This combination of fighting mad Americans and the high capacity of our well-oiled production system will win the war. But this is no small task.

In the first act of "Billets to Bullets" we see several gondola cars and a snorting locomotive moving along

the spur-track entrance to a huge plant where formerly the entire production effort was concentrated on the building of agricultural equipment. Here in this large, modern, metal working plant it is literally true, men are beating their plowshares into shells.

As the giant locomotive speeds away with a load of the finished product, a forty-ton crane with electric magnet sets to work to relieve the gondolas of their creaking overloads. With every lift of the magnet the springs under the cars slowly push their way back to normal length. The stock being unloaded is twenty feet long, $5\frac{1}{2}$ x $5\frac{1}{2}$ inches square, and mill marked X1335.

A Battery of Power Saws cutting x1335 Shell Billets to 15-Inch Lengths



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Flexible
Shaft
Equipment

More Versatile Machines

for More Profitable work!

● The Haskins line includes direct drive units designed for continuous, high-speed service on sanding and polishing operations. It includes multi-speed countershaft units for light and heavy duty grinding, rotary filing and wirebrushing. In all, there are 30 different types of Haskins Equipment. But any one type will give you lower cost per man and machine hour on many different jobs! Write for Catalog No. 45 containing complete specifications and illustrating many money-saving applications. R. G. Haskins Company, 619 S. California Avenue, Chicago.

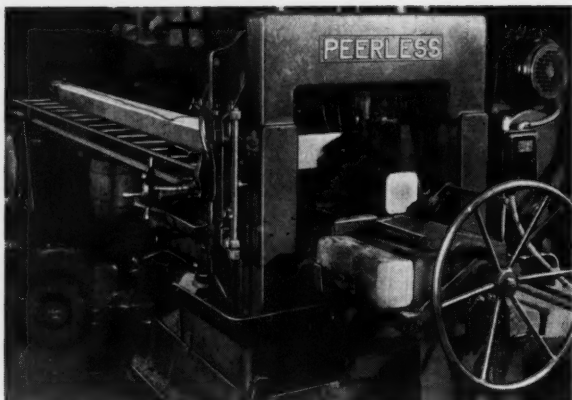


European Representative: G. E. Marbaix, Ltd., Humglas House, London, S.W.1.

HASKINS

Versatile

FLEXIBLE SHAFT
EQUIPMENT



The Blade is Lowered to and Fed Into the Work Under Correct Hydraulic Feed Pressure

Act 2—Billets Piled High at the Saws

As the curtain rises on act two, a battery of power saws is chewing the steel with a silence, rhythm, and speed comparable to that of a skilled wood-worker as he saws his way through a heavy board. Also human-like, the hydraulically controlled power saws perform and repeat their cycles with little attention. But, much unlike human hands, the saws never tire and never stop.

When the saws are equipped with hydraulically operated conveyors, the cycle continues from noon until night with only the aid of the reload man. As the operation progresses, the cycle may be divided into six parts:

- 1—The blade is lowered to, and fed

into the work under the correct hydraulic feed pressure . . .

- 2—At the conclusion of the cut, the blade rises clear of the cut, double quick, to permit,

- 3—The opening of the stock locking vise and

- 4—A pull forward on the remaining piece of stock . . .

- 5—Length gauging is automatic, too . . .

- 6—Locking vises are closed hydraulically, and the cycle repeats.

Sawing continues at the speed set on the dial indicator until the last remaining stub of material automatically stops the saw for reloading.

Hand operated conveyors, similar to the automatic conveyors, also may be installed on plain type machines. Where hand operated conveyors are used it is necessary for the operator to roll the stock forward at the completion of each cut.

The required length of the pieces for forging 155 mm shells is 15 inches. It is very important that the billets be cut accurately to length and ab-

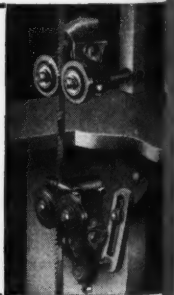
BLADE - BREAKAGE STOPPED . . . PRODUCTION INSURED BY

PADDOCK BALL BEARING BANDSAW GUIDES

Recommended for new and old machines.

Sent on 10 days trial—write for details and list of manufacturers using them as new equipment.

PADDOCK TOOL CO. GUIDE MAKERS SINCE 1920
KANSAS CITY • MISSOURI



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August, 1942

They Choose Van Dorn Tools in Wartime

Because

"they stand up better than any others"

"they increased production 300%"

"they show unusually low maintenance costs"



Here's what Van Dorn users Report . . .

"We tried four or five different brands before . . . We have had excellent satisfaction with Van Dorn Tools since."

" . . . these tools save about half the time necessary previously for screw driving . . . "

"Van Dorn Nut Runner saves 50% in time, makes a 50% increase in production . . . "

"Van Dorn Screw Drivers and Wrenches have increased production 100%."

2 Man-hours a day saved.
Van Dorn Power Buffer
cleaning stainless steel.

War Cargo Ships
get these blowers on which Van
Dorn Grinder smooths welds.

THAT'S the story right there. Van Dorn Portable Electric Tools push up war production because they are engineered for top tool-speed and top handling-speed. They

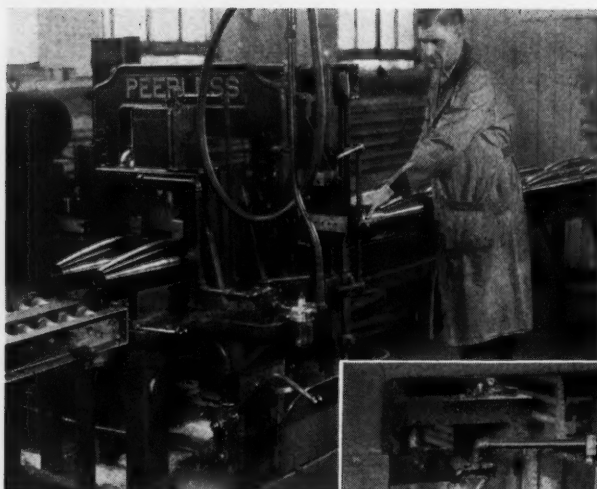
stand the gaff because they're built for it. The largest system of Factory-owned Service Branches in the industry is behind them when parts or overhaul are needed.

Ask your Van Dorn jobber for help in tooling up for war production. He'll show you what Van Dorn Tools are doing for others and demonstrate what they can do for you. The Van Dorn Electric Tool Co., 720 Joppa Road, Towson, Maryland.

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS



A 14-Inch Peerless Saw cuts the 2-Inch Butt-End After the Forgings Leave the Machine Shop

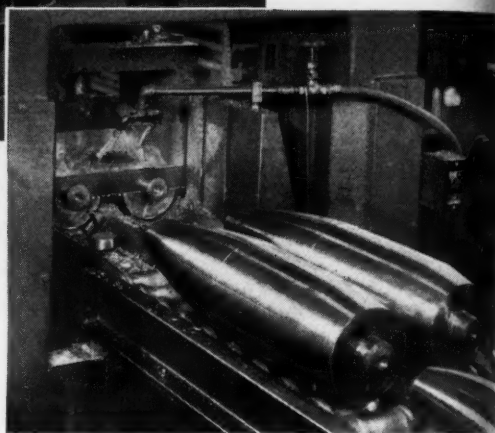
a red-hot billet is lifted out, another squarely cut piece, $15 \times 5\frac{1}{2} \times 5\frac{1}{2}$ inches is dropped into the gas and oil-fired rotary furnace to start its

solutely square to avoid trouble at the forge. When the cherry-red billets are removed from the furnaces, they must set squarely on end, ready for drawing and piercing. Besides the importance of square, accurate cuts it is essential that the face of the cut be protected against the damaging effects of high cutting temperatures.

High cutting heat may alter the analysis of the stock. And any cutting method that causes fracturing may be responsible for damage to equipment. Sawing cannot surface harden nor fracture the precious metal. The cool-cutting blade removes as little as $\frac{1}{16}$ inch of fine steel chips which are instantly washed away by the coolant. The small amount of metal removed means less cutting time in the shell plant, less haul-back tonnage for the railroads, and less reroll time for the mills.

Act 3—Billets at the Forge

Billets move fast at the forge. As



cycle in heat treatment. The treated billet is dropped onto a conveyor, passed through a scaling operation and dropped nose downward into a thousand ton hydraulic piercing punch press. In $2\frac{1}{2}$ seconds the billet is drawn to a length of $29\frac{1}{2}$ inches and $6\frac{3}{4}$ inches in diameter. A 300-ton hydraulic ram ejects the shell forging which is set aside, cooled, and later conveyed to the machine shop where it is turned to size.

Act 4—Sawing Off the Butt End

After the shell forgings have been turned down to correct dimensions in the machine shop, they are placed in double line formation on the conveyor

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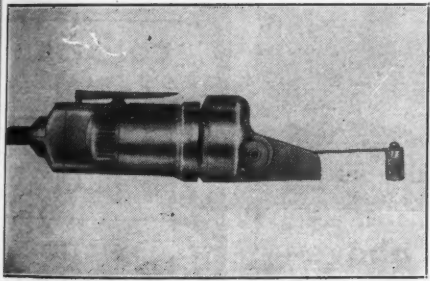
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ust, 1942

SPECIAL-PURPOSE SCALER CUTS TIME 50%



↑ **SCALING WELDS** in half the time with the CP 800 Special-Purpose Scaler, a time-saving tool for scaling welds, cleaning castings, peining and similar jobs.



↑ **CHIPPING WELD FLUX**, scaling welds, are only two of the many uses of CP Universal Electric Special-Purpose Scaler. Write for further data.

SCALES WELDS ON FLAME-CUT STEEL IN HALF THE TIME

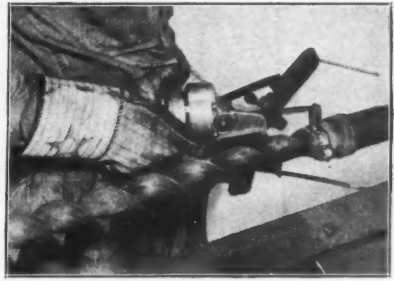
New CP Tool Has Many Uses

NEW YORK—(CP)—A manufacturer of mining machinery is scaling welds on a flame-cut steel bed with a CP Special-Purpose Scaler in half the time required to do the same job with a file. In the same plant the Special-Purpose Scaler is also used for scaling weld flux.

Write for complete data on the CP Special-Purpose Scaler and other CP Universal Electric Tools.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 9 E. 44th St., New York, N. Y.



↑ **THE RAPID BLOW** of the motor-driven spring handle, plus flexing of the spring, insures fast, clean weld flux scaling.

CHICAGO



PNEUMATIC

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ALSO: Air Compressors, Pneumatic Tools, Hydraulic Aviation Accessories, Diesel Engines, Rock Drills

BI-CYCLE and UNIVERSAL Drills, Sanders, Nut Runners, Screw Drivers, Grinders, Sanders, Tappers

line and sent through the saw for the final butt-end cut.

A 14-inch Peerless High Duty Saw is used for this purpose. The air-operated holding vise securely locks the shells in place while the 2-inch butt-ends are removed. A four point 0.072 x 1.5-inch high speed blade is used. Between 2,000 and 3,000 square inches are cut with a single blade when the best coolants are used. The saw is operated at high speed—125 strokes per minute. Low and intermediate speeds, 50 and 85 strokes per minute, can be engaged instantly as conditions require.

After the butt-end cut has been made, the shells are weighed as a final check on their uniformity before they are released for filling.

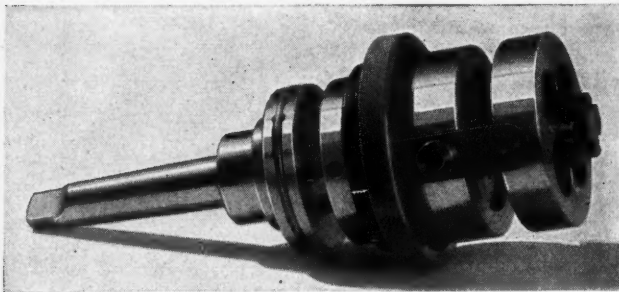
Every operation from "Billets to Bullets" is handled with the utmost speed to back up the men in the front lines of our fighting forces. The type of shell described here is pro-

jected from a husky, short barreled gun, commonly called a mortar gun.

The fact that a single gun can project shells faster than a full factory shift can produce them is a challenge to American industry as well as the back-home worker who is determined to keep 'em shootin'.

Waltham Thread Miller. A four-page bulletin covering the Waltham Thread Miller as to construction features, operation, specifications, equipment available, and so on, is now being issued by the Waltham Machine Works, Waltham, Mass. Copy free upon request.

"Drive-All System of Individual Motor Drives" is the subject of an eight-page catalog prepared by the Drive-All Mfg. Co., 3400 Conner Ave., Detroit, Mich. An outstanding feature of the catalog is the full treatment of a simplified technique of mounting individual motorizing units with standardized brackets on any type of machine tool. Copy of catalog free upon request.



Model BR Collapsible Tap above—

Live spindle type—Work remains stationary—Tap revolves. Also made in Model B where work revolves and tap remains stationary. By the use of the external trip design, these two models are simply made with a few parts.

**AUTOMATIC
DIE HEADS**

**COLLAPSIBLE
TAPS**

**BORING
HEADS**

**FRICTION
TAPPERS**

**SPECIAL
THREADING
MACHINES**

The RICKERT-SHAFER Co.
ERIE, PA.

barrelled
star gun.
can pro-
factory
challenge
all as the
terminated

four-page
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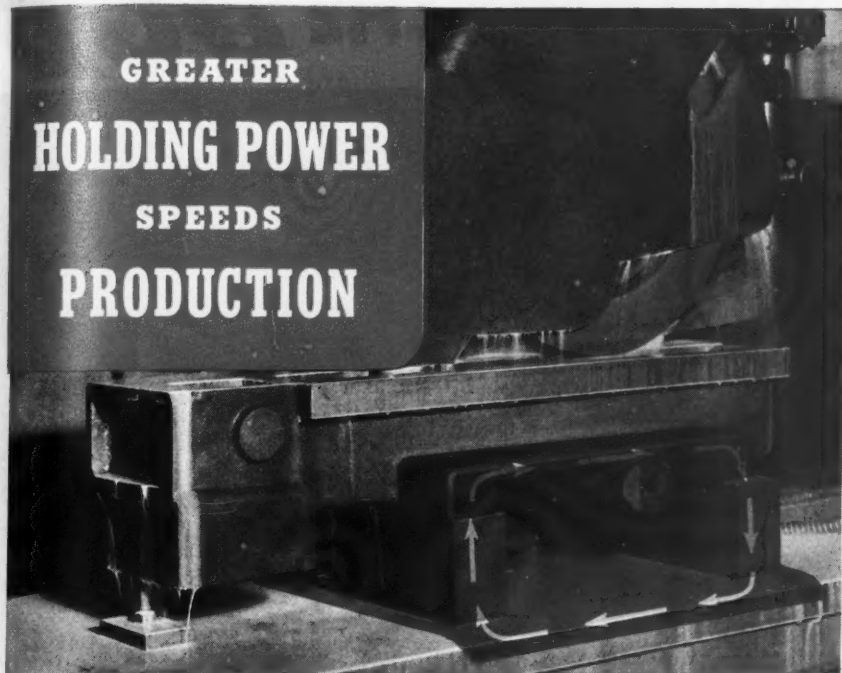
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GREATER HOLDING POWER SPEEDS PRODUCTION



Powerful "Magnetic Body Flo" (in red) securely locks work, chuck and parallel to the working table.

● The ANDERSON & BROWN Magnetic Chuck goes beyond the limitations of the conventional chuck which uses "skin" or surface magnetism. It presents a new and extremely desirable method of holding work.

"Magnetic Body Flo" is the principle involved in holding work with the ANDERSON & BROWN Magnetic Chuck. The magnetic flux flows through the work, the parallel and back to the chuck through the working surface of the grinder, locking all elements tightly together.

The necessity of special holding devices

is greatly reduced. Its adaptability, flexibility and intense holding power eliminate in many cases these special fixtures.

Discover how the quick set-ups and other advanced features of this chuck can save you time and money. Send for your copy of "Magnetic Chucking Revolutionized."

SEND ME
"MAGNETIC CHUCKING
REVOLUTIONIZED"

ANDERSON & BROWN CO.

2038 East 22nd Street, Cleveland, Ohio

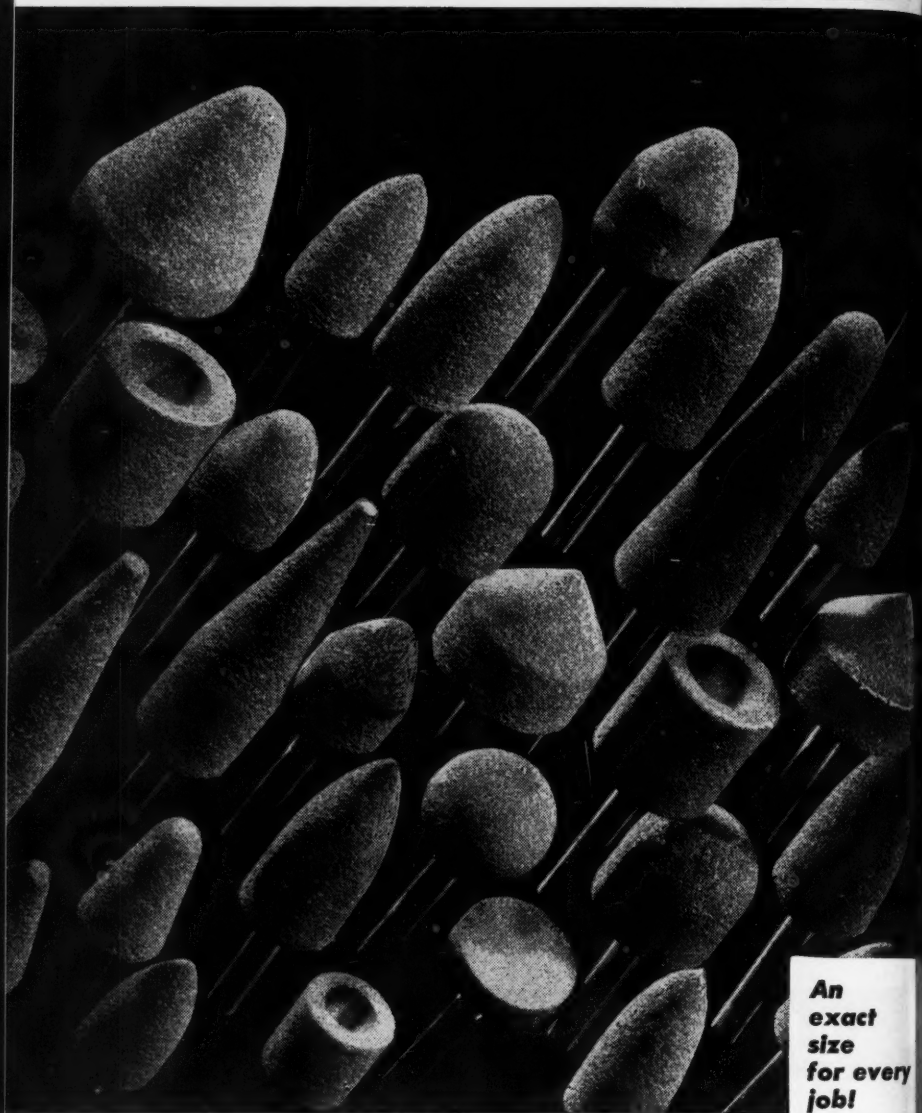
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FINISHING THE *JOB*



**An
exact
size
for every
job!**

Chicago Wheels were the first small wheels mounted on steel shanks. Today there are over 200 different shaped wheels to serve you—made in a variety of abrasives, grains and grades, mounted on shanks of various lengths and diameters of 1/4", 3/32", 1/8" and 3/16".

BEHIND THE LINES..

Keeping up with Uncle Sam's victory drive for more tanks and guns and planes, Chicago Mounted Wheels are doing a big finishing job in shops everywhere—taking care of every kind of delicate or tough grinding job faster, smoother and better.

CHICAGO  **MOUNTED WHEELS**

Made of V/T Super Bond, they have real stamina, give unmatched performance and last 150% to 300% longer than ordinary wheels.

HI-POWER GRINDER

A real production grinder that is saving many man hours. Weighs 3 lbs., yet is so well balanced that fatigue is practically eliminated. Has enough power to drive a 2½" diameter wheel. 17,000 r.p.m. in case with 3 Chicago Mounted Wheels, Drum Sander and Bands, extra Collets, Wrenches, Dressing Stone, \$38.50.



TRY ONE ABSOLUTELY FREE

Tell us the kind of job, size and wheel speed you use, and we'll send you a test wheel postpaid.

CHICAGO WHEEL & MFG. CO.

Makers of Quality Products for 40 Years

1101 W. Monroe St.,

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Chicago, Ill.

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BRAND NEW CATALOG

Just off the press, this book is prepared in the modern manner — loads of illustrations, concise descriptions of the complete line of Chicago Mounted Wheels.

☐ Send Hi-Power ☐ Catalog

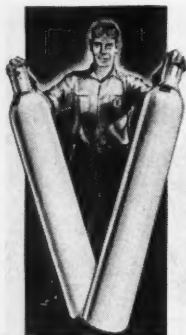
☐ Free Wheel Size _____

Name _____

Address _____

MM-8

Are You Wasting Oxygen?



It is inevitable that, with the rapid expansion of oxyacetylene welding and cutting, wasteful practices should increase also. This article is intended to serve as a "check list," to help all concerned to prevent a serious oxygen supply situation from becoming critical

By G. A. VAN ALSTYNE
Air Reduction Sales Company

KEEPING war production industries supplied with an unceasing flow of oxygen and acetylene for welding and cutting is no less essential than providing the metals needed for production. Demand for these gases has increased enormously. For some time, gas manufacturers have been hampered in their efforts to meet this demand by a shortage of the cylinders used to transport gases, but now there has arisen another cause for concern.

The oxygen production capacity of the oxyacetylene industry is being strained to the fullest extent in an attempt to keep abreast of constantly pyramiding oxygen requirements. In spite of the additions and expansions of oxygen and acetylene plants, however, a critical situation faces this industry—and all industries that depend upon these gases—unless definite efforts are made by everyone concerned to conserve the supply, particularly in the use of oxygen.

A survey has revealed a considerable number of shop practices which might be disregarded in peacetime, but which today must be considered wasteful. These habits of yesterday, being largely the result of inert thinking, can be remedied only by a re-evaluation of the significance of such seemingly trivial practices as using the wrong size hose or torch tip, or opening up a full cylinder when a quarter-full cylinder stands idle.

The following list of recommended practices is based upon observations of current conditions in oxyacetylene welding and cutting shops. The elimination of wasteful practices will not only go a long way toward relieving the "tight" oxygen situation and insuring an uninterrupted supply of gases, but will also prove economical to the individual shop where such conditions prevail. One shop, for example, was found to be unconsciously wasting approximately 25 per cent of its oxygen consumption through an

accumulation of "insignificant" losses.

1. Use the proper size torch tip.

A No. 2 tip used instead of a No. 1



Check Tip Size. An Oversize Tip Wastes Gas. If Number is Not Clear, Check with Cleaning Drill

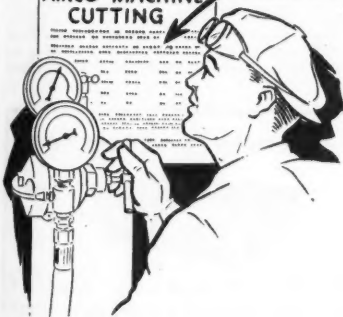
for cutting 1/2-inch plate consumes 10 to 20 per cent more oxygen and 16 per cent more acetylene—all of which is wasted.

2. Do not use excessive pressures.
- This malpractice, one of the most common, is usually perpetrated by inexperienced operators who believe

APPROXIMATE GUIDE FOR AIRCO MACHINE CUTTING

THINK OF THE PRESSURE AS BEING THE SAME AS THE PRESSURE IN A TIRE. IF THE TIRE IS OVERPUMPED, IT WILL BURST. IF THE PRESSURE IS TOO LOW, IT WILL NOT HOLD AIR. THE SAME PRINCIPLE APPLIES TO THE AIRCO MACHINE. IF THE PRESSURE IS TOO HIGH, THE BLADE WILL BURST. IF THE PRESSURE IS TOO LOW, THE BLADE WILL NOT CUT.

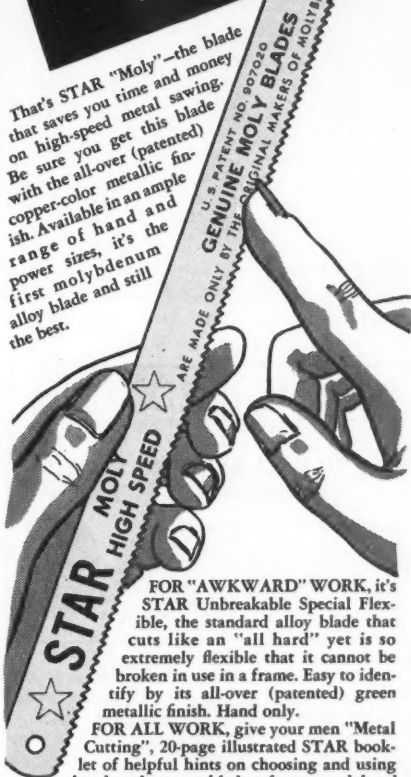
CHECK PRESSURES



Watch the Pressure. Excessive Pressure Wastes Oxygen. Keep Pressure Chart Handy, and Use It

THERE'S ONLY ONE "MOLY" BLADE

That's STAR "Moly"—the blade that saves you time and money on high-speed metal sawing. Be sure you get this blade with the all-over (patented) copper-color metallic finish. Available in an ample range of hand and power sizes, it's the first molybdenum alloy blade and still the best.



FOR "AWKWARD" WORK, it's STAR Unbreakable Special Flexible, the standard alloy blade that cuts like an "all hard" yet is so extremely flexible that it cannot be broken in use in a frame. Easy to identify by its all-over (patented) green metallic finish. Hand only.

FOR ALL WORK, give your men "Metal Cutting", 20-page illustrated STAR booklet of helpful hints on choosing and using hand and power blades, frames and band saws. It's yours free for the asking.

CLEMON BROS. INC.
MIDDLETOWN • NEW YORK

2634

that thereby they get a more efficient flame, or to save a trip to the pressure chart. Manufacturers' rated



Close Cylinder Valve When Finished. Between Jobs Release Regulator Screw to Prevent Loss of Gas Through Hose Leakage

pressures are the most efficient for average conditions. And when more speed is desired, the new high speed

machine cutting tips cut faster without consuming additional oxygen.

3. Close cylinder valves when torch is not in use. If only the torch valves are closed, gas pressure in the hose builds up and may force leaks. If leaks are already present or if new leaks are forced, considerable gas will be lost.

4. Check hose and connections for leaks. They may be infinitesimal, but a 1/64-inch diameter leak in hose operating at 100 pounds pressure will waste 290 cubic feet of oxygen in 24 hours—more than a tankful. The hose should be checked periodically



Check Hose Periodically for Leaks. Dip Hose in Water While Under Pressure and Watch for Bubbles. Use Soap-Water on Connections

WHITNEY - JENSEN TOOLS

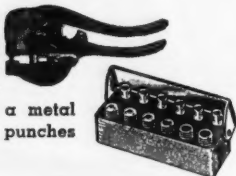
No. 20 BALL BEARING PUNCH

• Capacity $\frac{1}{2}$ " through $\frac{1}{2}$ " iron. Will also drive rivets. Made of alloy steel and heat treated throughout.



No. 5 JR. PUNCH

• Capacity $\frac{1}{4}$ " hole in 16 gauge. Available in a paper carton or a metal box with seven punches and dies.



Whitney Metal Tool Co.

110 FORBES ST. ROCKFORD, ILL.

New Nesting Type Tote Pans



20" long x 12" wide x $6\frac{1}{2}$ " deep. 16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.

1 Fox Street Bridgeport, Conn.

SELF LUBRICATING

Ledaloil



BEARINGS

for **SMOOTH . . . QUIET PERFORMANCE**

Get the facts

New data sheets . . . giving you complete, authentic facts concerning LEDALOYL are now available. Write for a complete set.

● Independent tests . . . under actual operating conditions . . . have proven LEDALOYL to be the finest self-lubricating bearing available. An exclusive process of PRE-ALLOYING the basic materials imparts many valuable bearing qualities not achieved through ordinary manufacturing methods. For instance, it permits the introduction of Lead—as an integral part of the bearing . . . provides structure control and control of the lubricating action . . . guarantees absolute uniformity. You can prove all of these facts . . . right in your plant . . . on your product. Write—on your business letterhead—for free samples and make your own comparisons.



JOHNSON BRONZE

Sleeve **BEARING HEADQUARTERS**

590 S. MILL STREET • NEW CASTLE, PA.

August, 1942

MODERN MACHINE SHOP 175

Butterfield Taps



The Defense Program
requires small tools
that are accurate
and long lived.

Butterfield Taps
have a reputa-
tion for both
of these
character-
istics.

**UNION TWIST DRILL CO.
BUTTERFIELD DIVISION**
Factories: DERBY LINE, VERMONT, U. S. A.
Athol, Mass.; Mansfield, Mass.;
Rock Island, Quebec, Can.

STORES:
Cleveland, 3346 Superior Ave.
Chicago, 11 S. Clinton St.
Detroit
6540 Antoine St.
New York
61 Reade St.

by immersing it in water while under pressure to show up leaks. Soap and water will reveal leaks at connections.

5. Use correct-diameter hose. Hose that is too small for the job requires higher gauge pressure to secure sufficient flow, causing unnecessary



Long Hose is Cumbersome and Requires More Pressure. Extra Lengths Get Unnecessary Wear, Invite Leaks. Use Short Lengths

strain and promoting leakage in the hose.

6. Use short lengths of hose. Unnecessarily long hose also requires higher pressure in order to overcome pressure drop at the torch. Also, the surplus lengths, though unnecessary for the job, are subjected to unnecessary wear and tear.

7. Use all the gas in each cylinder before connecting a new one. Use every cylinder for all it is worth before disconnecting it. In the larger shops interruptions of work to change tanks can be eliminated by manifold-

hile un-
s. Soap
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requires
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ecessary

PRODUCE STILL MORE
*get 20% greater tool
efficiency with*

MO-MAX

TRADE MARK REG. U.S. PAT. OFF.

MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL

Milling cartridge clear-
ance slot in machine gun.
On jobs such as this,
MO-MAX is the logical
choice.



MO-MAX makes possible maximum con-
servation of vital alloys.

- 1 It contains less than two percent of tungsten. This amount is being produced in this country or is available from existing high speed steel scrap.
- 2 It contains only one percent of vanadium—a critical alloy.
- 3 Molybdenum is produced in large quantities within our borders.
- 4 A chromium content of 3.50 to 4.00% is satisfactory—thus a minimum of chromium is required.
- 5 MO-MAX has a nine-year record of proved performance, and can be obtained from fourteen leading steel manufacturers.

For Technical Data Booklet!

Write any of the steel
makers listed or to The
Cleveland Twist Drill Co.,
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LMW ... Alleghany Ludlum Steel Company
MOHICAN ... Atlas Steels, Ltd.
BETHLEHEM HM ... Bethlehem Steel Company
MO-CUT ... Braeburn Alloy Steel Corporation
STAR MAX ... Carpenter Steel Company
MOLITE 8 ... Columbia Tool Steel Company
REX TMO ... Crucible Steel Company of America
DI-MOL ... Henry Diston & Sons, Inc.
REX TMO ... Halcomb Steel Division
... Crucible Steel Company of America
MOGUL ... Jessop Steel Company
TATMO ... Latrobe Electric Steel Company
S.T.M. ... Simonds Saw and Steel Company
MO-TUNG ... Universal-Cyclops Steel Corporation
VUL-MO ... Vulcan Crucible Steel Company

⊕ 2426

ATLANTIC

NON-TEMPERING TOOL STEEL

In the New Steel Shape

FLUTAGON

The SAFETY STEEL

This new steel shape furnishes a convenient, positive grip for chisels, punches, cutters and blacksmiths' tools.

This shape minimizes chipping and splintering.

Drawing of temper to suit different requirements is unnecessary and completely eliminated. Suitable hardness is obtained by merely heating the tool and quenching it in water.

Distinctive

Vacuum Grip

Safer

Write for complete details

ATLANTIC STEEL CO.

1775 BROADWAY

NEW YORK • NEW YORK

Developers of Non-Tempering Tool Steel



Keep Cylinder Inventories Low. Order Fewer Cylinders at a Time, and Order Often

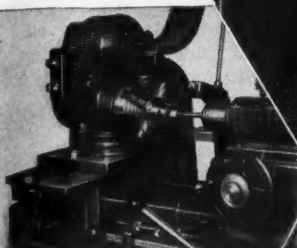
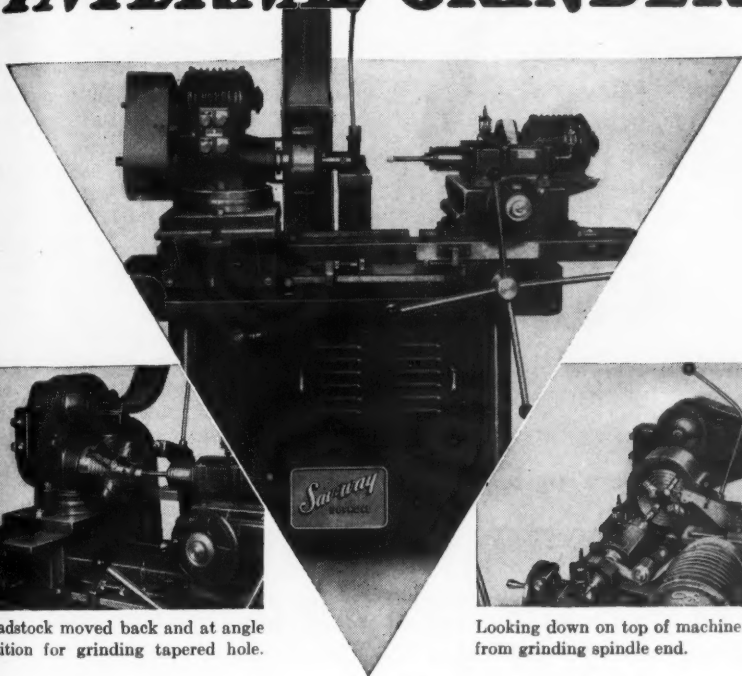
ing gas cylinders, or by installing pipe lines.

8. **Keep cylinder inventories low.** The old custom of keeping plenty of reserve cylinders on hand must be abandoned, for it "freezes" the available supply at a time when rapid turnover is imperative. Gas suppliers are cooperating by providing frequent deliveries. You can help by ordering fewer cylinders oftener, and

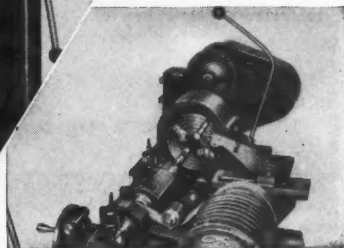


Don't Let Torches Burn Unused. Even Three Minutes Out of Each Hour Means a 5 Per Cent Gas Loss. Oxygen is Precious Now; Don't Waste It

Sav-way MULTI-PURPOSE **INTERNAL GRINDER**



Headstock moved back and at angle position for grinding tapered hole.



Looking down on top of machine from grinding spindle end.

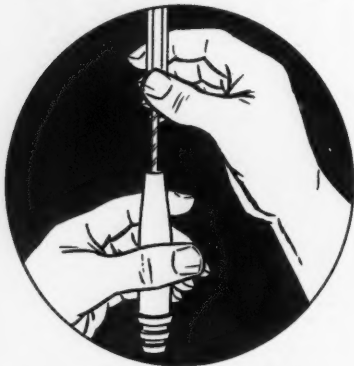
Offers greater flexibility . . . a precision grinder, designed and built by engineers with years of practical experience to guide them . . . has a headstock traverse of 6" . . . grinds holes $\frac{1}{4}$ " to 18" in diameter . . . holes up to 9" deep, straight or tapered . . . entire headstock may be moved at right angle to wheel traverse, by merely loosening two conveniently located nuts . . . worm compensating device permits grinding wheel head adjustment to .0001 . . . sturdy construction throughout . . . full specifications, delivery time and price on request.

Distributors throughout the U. S. and Canada to serve you.

***Sav-way* TOOL AND MACHINING CO.**
13840 JOS. CAMPAU AVE. DETROIT, MICHIGAN

by keeping reserves of cylinders at a minimum.

9. Return empty cylinders prompt-



Keep Your Tips Clean. Congested Tips are Inefficient; Waste Time and Gas. Keep Cleaning Drills Handy, and Use Them

ly. Idle cylinders are production slackers.

10. Don't leave torches burning

when not in use. It may seem troublesome to be constantly re-lighting the torch, but if it burns idly for even as little as 3 minutes out of each hour, it is wasting 5 per cent of its gas consumption. Five per cent of last year's industrial oxygen consumption was 360 million cubic feet. Let's use those 1,636,000 tankfuls for welding and cutting, not for heating the air.

11. Keep tips clean and free from carbon and slag. An unclean tip is an inefficient tip, and, like any dull tool, is abhorrent to the skilled workman. Congested orifices nullify the value of using proper pressures and speeds, resulting in lower efficiency and consequent waste of gas.

12. Don't abuse cylinders. A damaged cylinder must be taken out of circulation. It contributes nothing to the war production effort while undergoing repairs.

13. Hose—handle with care. Be-

HIGH-SPEED STEEL TEETH with Curved Gullets

RED STREAK
INSERTED TOOTH METAL SAWS



SIMONDS SAW & STEEL CO., FITCHBURG, MASS.

seem trou-
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Keep Hose Clear of Sparks and Slag. Avoid Serious Fire Hazards. Minute Burns Promote Leakages. Hose is Made of Rubber, and Should be Conserved. Don't Mistreat It

cause hose is made of rubber, it is most important that it be made to last as long as possible. To ensure this, it must be protected against mistreatment which promotes leaks. Therefore, keep hose out of range of hot oxide and sparks; wash off oil and grease (which ruin rubber); place a plank on each side of the hose where it crosses truck runways;

difficult of accomplishment, provided we open our eyes to wasteful practices. Industry needs many waste wardens; they may be unofficial, they may be self-appointed, but if they watch out for wasteful practices among themselves and their co-workers they will be performing a very real service.

store any hose stocks in a cool, dark place; and when a hose is damaged, cut out the bad portion and splice the ends together with standard splicing nipples.

Essentially these suggestions involve but one basic concept — to uproot yesterday's habits so as to meet today's demand. None of the recommendations is

"Conserve Your Oil" is the title of a four-page folder released by the Gale Oil Separator Co., Inc., Chrysler Bldg.,

New York, N. Y., covering the features, operation, and so on, of the Gale Reclamation Oil System. Copy free.

ACROMARK means "ACCURATE MARKING"

and the ACROMARKER is only one of the FAST but simple machines our engineers build for marking.

This machine is provided in several sizes and special fixtures are made for special work.

Send us your marking problem—Priority deliveries are FAST.

WRITE FOR CATALOG No. 52.

THE ACROMARK CORPORATION

9 MORRELL ST., ELIZABETH, N. J.



Citations for Meritorious Effort



to the men behind the
men behind the guns

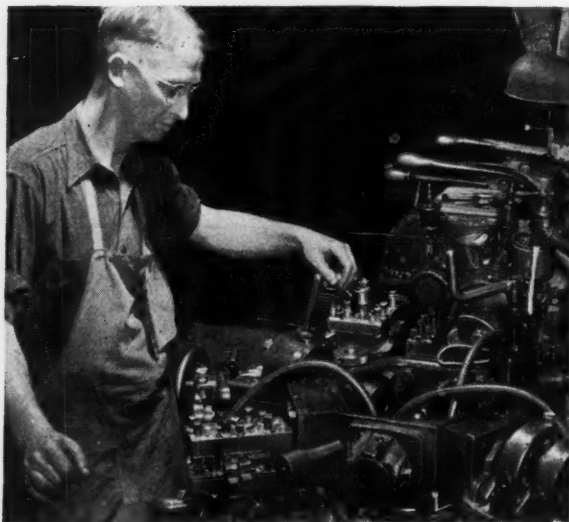
EVERY day in every recruiting office in the United States young men line up for induction into the armed forces of the Nation. Every day hundreds of these inductees start on their way to the training camps, and every day our armies, trained and hardened for the fight that is ahead of them, start on the trek to the fighting front—wherever it may be.

America's fighters are on the move

—on the land, on the sea, and in the air, in trucks, tanks, ships, and planes — equipped with the best guns and fighting materials that can be made, designed by American engineers and produced by American mechanics. But the production job is only begun. If our armies are to be built up to victory strength, and if our fighters are to have all the guns and shells and equipment they will need to win their

battles, our war plants must be kept running at top speed, night and day.

Nothing less than the most and best that we can produce is good enough. Every effort must be made to get the most speed out of the machines; the most use out of the



Karl S. Dooley, presented here, worked out a way to get seven operations performed with a six-station turret—and saved all of the time required for the seventh operation. Awarded an "Ideas for Victory" pin.

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Don't OVERLOAD YOUR HOIST

Although **WRIGHT HOISTS** are built with load-carrying factors much in excess of their rated capacities, like many other well-made pieces of mechanical equipment built for specific duty, they should not be overloaded. Overloading is dangerous—to men, materials, machinery and steady production. Abuse to machinery, today, is akin to sabotage.

WATCH THE BOTTOM HOOK

Wright load hooks are drop-forged from special steel which, when subjected to excessive overloading, gives visible warning by opening slowly. When the bottom hook has started to open, look to the top hook, too, for while it is stronger than the bottom hook, it also may be reaching a danger point.

WATCH THE LOAD CHAIN

WRIGHT HOIST load chains are electrically welded from special analysis steel, exceptionally high in tensile strength and elastic limit. Chains that are excessively overloaded will stretch out of pitch, thus preventing proper fit with precision load wheel pockets. This results in destructive wear to both chain and load wheel. Keep your chains well-lubricated for long life.

Victory demands all out efficiency in production. Victory demands speed. Victory demands steel. Abuse of machinery wastes all three. Take proper care of your **WRIGHT HOIST** so that it lasts. You can find the name of your nearest Wright distributor in the telephone book.

WRIGHT MANUFACTURING DIVISION

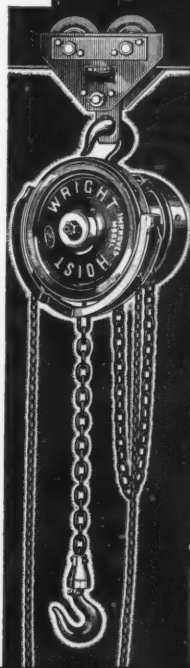
York, Pa., Chicago,
San Francisco, New York

In Business for Your Safety



AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT - CONNECTICUT



1/4 TO
50 TONS





Another "Ideas for Victory" pin recipient was Norman Snyder, who made a stock stop for his machine that saves time in chucking.

have been received at the Warner and Swasey offices as a result.

A turret lathe is a key tool in the production of precision parts for war materials and fighting units. New turret lathes cannot be produced fast enough to meet the need, consequently thousands of operators

tools. Ways must be found to cut corners and save time and materials—and the mechanics and machine operators in the shops can do just as much along this line as the engineers and designers. In fact, the men who operate the machines and put the parts together on the assembly lines will frequently see opportunities to save on time and materials and costs that would not occur to those who were not in such close contact with the actual production jobs.

Recognizing this fact, many months ago the firm of Warner and Swasey, Cleveland, Ohio, manufacturers of turret lathes, started developing an idea for awarding citations to turret lathe production men who show praiseworthy initiative and ingenuity in increasing production, or who produce unusually fine and accurate work on their machines. The idea has been explained in "Blue Chips"—a Warner and Swasey publication which is sent monthly to nearly 30,000 turret lathe operators — and hundreds of ideas

must do the best they can with what they have at hand. Here is where the opportunity for suggestions as to improvements in the design of the tools and methods of handling the work comes in.

All worth-while suggestions thus received are acknowledged and a specially-designed "Ideas for Victory" pin with the operator's name engraved on it is sent to the sender of the suggestion. The reverse side of the pin carries the legend "Awarded by Warner and Swasey." The ideas and the names of the men who developed them are also featured in the Warner and Swasey Company's advertising.

In some shops the management was unaware of the good ideas that had been developed in their own shops by their own men until they saw the pins, and in a number of instances the result has been that management has asked that the pins be sent to them so that the presentation of the pin could be made a shop ceremony.

BECAUSE IT "BREATHES!"

**NEW POROUS GRINDING WHEEL GRINDS
COOLER, LOADS LESS, UPS PRODUCTION**

2 TO 5 TIMES

TRY THIS NEW Grinding Wheel that "breathes!" Porous and "stringy" in texture, something like a sponge, Por-os-way's millions of air cells cool each grinding point between contacts.

RESULT? Production speeded up 2 to 5 times! Each man, each machine, does the work of from two to five. You get deeper cuts—up to .010" or more—or your regular cut at faster speed.

FREE CUTTING. Por-os-way may be used on hardened tool and die steels. Also on softer materials such as aluminum, copper, tin, wood, rubber, and plastics for resists loading.

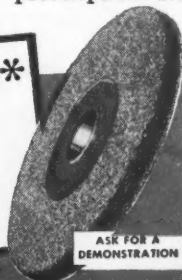
YEARS' RESEARCH. The research which

uncovered Por-os-way goes back three years. Timely as this wheel seems in today's situation, it is only coincidence that Por-os-way is offered now. You needn't fear that it's an "experiment".

"PRESCRIPTION-FITTED" Our experience has led us to offer Por-os-way only through specific prescription. It is never sold as a stock wheel. Sizes of air cells, grade and grain vary—and our engineers will determine the best for *your* job.

WE KNOW YOU'RE BUSY So we say: Just tear out and mail the corner of this page with your name, position, company and address. You'll receive a fully descriptive booklet—and a "prescription" blank for your use.

POR-OS-WAY*
a new
RADIAC* PRODUCT



ASK FOR A
DEMONSTRATION

Manufactured by A.P. de Sarre & Son, Inc., 1000 W. 12th St., Phoenixville, Pa.



Another "Ideas for Victory" pin recipient was Norman Snyder, who made a stock stop for his machine that saves time in chucking.

have been received at the Warner and Swasey offices as a result.

A turret lathe is a key tool in the production of precision parts for war materials and fighting units. New turret lathes cannot be produced fast enough to meet the need, consequently thousands of operators

tools. Ways must be found to cut corners and save time and materials—and the mechanics and machine operators in the shops can do just as much along this line as the engineers and designers. In fact, the men who operate the machines and put the parts together on the assembly lines will frequently see opportunities to save on time and materials and costs that would not occur to those who were not in such close contact with the actual production jobs.

Recognizing this fact, many months ago the firm of Warner and Swasey, Cleveland, Ohio, manufacturers of turret lathes, started developing an idea for awarding citations to turret lathe production men who show praiseworthy initiative and ingenuity in increasing production, or who produce unusually fine and accurate work on their machines. The idea has been explained in "Blue Chips"—a Warner and Swasey publication which is sent monthly to nearly 30,000 turret lathe operators—and hundreds of ideas

must do the best they can with what they have at hand. Here is where the opportunity for suggestions as to improvements in the design of the tools and methods of handling the work comes in.

All worth-while suggestions thus received are acknowledged and a specially-designed "Ideas for Victory" pin with the operator's name engraved on it is sent to the sender of the suggestion. The reverse side of the pin carries the legend "Awarded by Warner and Swasey." The ideas and the names of the men who developed them are also featured in the Warner and Swasey Company's advertising.

In some shops the management was unaware of the good ideas that had been developed in their own shops by their own men until they saw the pins, and in a number of instances the result has been that management has asked that the pins be sent to them so that the presentation of the pin could be made a shop ceremony.

BECAUSE IT "BREATHES!"

**NEW POROUS GRINDING WHEEL GRINDS
COOLER, LOADS LESS, UPS PRODUCTION**

2 TO 5 TIMES

TRY THIS NEW Grinding Wheel that "breathes!" Porous and "stringy" in texture, something like a sponge, Por-os-way's millions of air cells cool each grinding point between contacts.

RESULT? Production speeded up 2 to 5 times! Each man, each machine, does the work of from two to five. You get deeper cuts—up to .010" or more—or your regular cut at faster speed.

FREE CUTTING. Por-os-way may be used on hardened tool and die steels. Also on softer materials such as aluminum, copper, tin, wood, rubber, and plastics for resists loading.

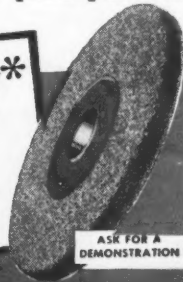
YEARS' RESEARCH. The research which

uncovered Por-os-way goes back three years. Timely as this wheel seems in today's situation, it is only coincidence that Por-os-way is offered now. You needn't fear that it's an "experiment".

"PRESCRIPTION - FITTED" Our experience has led us to offer Por-os-way only through specific prescription. It is never sold as a stock wheel. Sizes of air cells, grade and grain vary—and our engineers will determine the best for *your* job.

WE KNOW YOU'RE BUSY So we say: Just tear out and mail the corner of this page with your name, position, company and address. You'll receive a fully descriptive booklet—and a "prescription" blank for your use.

POR-OS-WAY*
a new
RADIAC* PRODUCT



ASK FOR A
DEMONSTRATION

Copyright 1942 by ALPINE SAND & SILEX, INC., 4000 WILSON BLVD., PHILADELPHIA, PA.



Among those who have received "Ideas for Victory" pins is Karl S. Dooley, a turret lathe operator at the Caterpillar Tractor Company, Peoria, Ill. Mr. Dooley worked out an idea for performing seven operations with a six-station turret, not only practically achieving the impossible, but taking no extra time for the seventh operation.

Another recipient of an "Ideas for Victory" pin is Norman Snyder, turret lathe operator at the plant of the Vaughn Machinery Company, Akron, Ohio. Mr. Snyder made a stock stop

An "Ideas for Victory" pin was awarded to J. H. Medling, shown here, for developing a relatively simple plug to hold small diameter washers in processing, eliminating the wait for a special arbor as well as the cost.

to be used in a turret lathe station, eliminating the need for exact location of the work in the chuck and thus saving a good deal of time.

Still another turret lathe operator to be honored

ed with one of the pins is J. H. Medling at the Aro Equipment Company plant in Cleveland, Ohio. Mr. Medling developed a relatively simple plug to hold small diameter washers in the lathe, thus eliminating the loss of valuable time waiting for a special arbor to be made up in the toolroom, and saving the cost of the special arbor.

There is no man, no matter how modest and unselfish he may be, who does not appreciate recognition of special ability, or extra effort, or the origination of a valuable idea. In these days we need that special effort and those valuable ideas as we have never needed them before. The Warner and Swasey Company should pin one of those pins on itself.

SCHAUER Speed Lathes



Write for Catalog No. 420

IDEAL for
**POLISHING
LAPPING
FINISHING**
of small parts.

"the originators
of today's
Speed Lathes"

SCHAUER MACHINE CO. 2060 Reading Road CINCINNATI, OHIO

"8 Ways to Speed Up Production" is the title of a four-page folder issued by the Ideal Commutator Dresser Co., 125 Park Ave., Sycamore, Ill., describing and illustrating eight "Ideal" products, namely "Ideal" "Triple-Duty" Live Center, Demagnetizer, Electric Etcher, Electric Marker, Balancing Ways, Grinding Wheel Dresser, "3-In-1" Cleaner, and Washer Punch. Copy free upon request.

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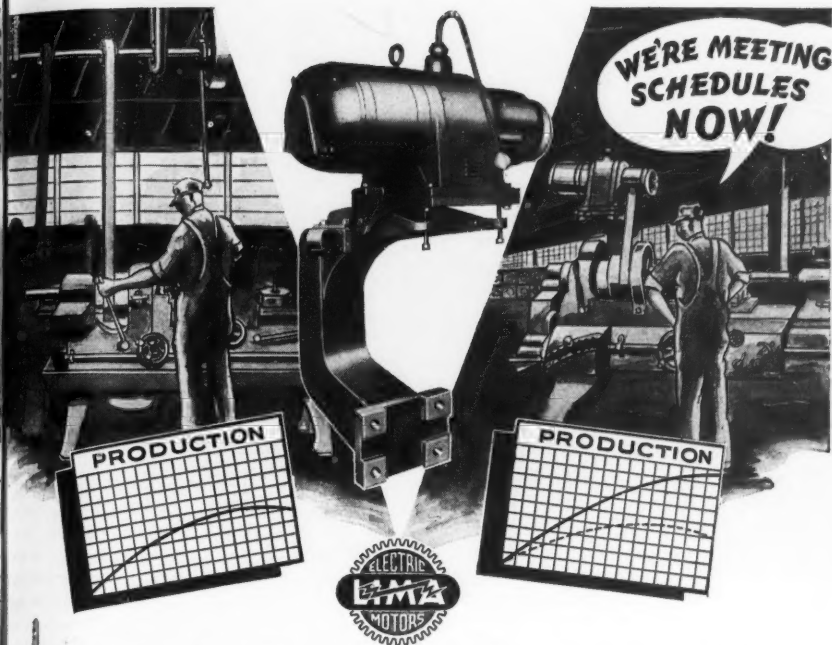
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No matter how tough your schedules are to meet—LIMA GEARSHIFT DRIVES will help you do the job. Whether its turning, milling, boring, planing, punching, shaping, gear hobbing, etc., Lima Gearshift Drives have been engineered to do the work with *Speed and Accuracy*. Built in sizes from 1 to 25 H.P., either direct motor or belt driven. Speeds up to 8 forward and 8 reverse. Standard mounting brackets available for most standard machines.

LIMA'S many important features have all been designed to meet specific requirements in the unit motorization of production equipment and to maintain *Speed with Safety*. Unsolicited letters of recommendation show that Lima Gearshift Drives are stepping up production from 20% on some types of work to 200% and over on other types. Why not investigate immediately the possibility of stepping up your production with Lima Gearshift Drives. Consult our engineers—their experience is yours for the asking in this common cause. **BEAT PRODUCTION SCHEDULES with LIMA GEARSHIFT DRIVES.**

REMEMBER! Increased Operator Efficiency means Increased Production so vitally necessary today.

Write or wire us today . . . Prompt attention to inquiries . . . Prompt Deliveries on Orders.

**SEND TODAY FOR FREE
DESCRIPTIVE, ILLUSTRATED
BULLETINS AND DATA SHEETS.**

DRIP-PROOF
1 to 75 HP

THE LIMA ELECTRIC MOTOR CO. EXPLOSION-PROOF
1 to 5 HP

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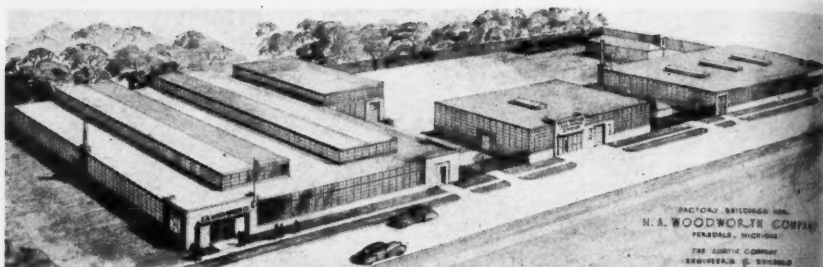
POLISHING LATHES

OPEN

VERTICAL

TOTALLY-ENCLOSED





New Plant of N. A. Woodworth Company

The N. A. Woodworth Company, Ferndale, Michigan, has been allocated funds for additional war production machinery and equipment which will make it one of the most important sources of precision aircraft engine parts in the country.

Only two years old, the Woodworth Company has been awarded orders totaling about 15 millions of dollars, and is the largest industry in Ferndale. Among the more than 100 precision war parts made by the company are knuckle pins, valve tappets, valve tappet sockets and

adjusting screws, and bearing retainers. These are said to involve machine work as exacting as that required in the manufacture of precision gages and measuring instruments.

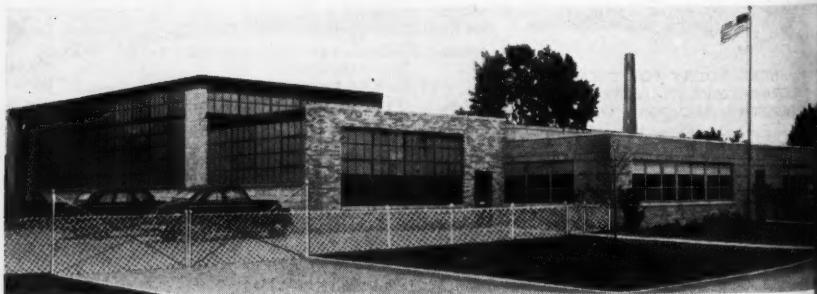
Since March, 1940, the company has manufactured 4,000,000 items on government production. This high production rate is credited to (1) a systematic program for unskilled labor which, in a minimum of time, qualifies men and women for skilled work, and (2) plant equipment which can be tooled for war work with a minimum of loss in machine hours.

Syncro Devices Absorbs Welco Precision Products

Syncro Devices, Incorporated, 3265 Bermuda Ave., Ferndale, Mich., has absorbed the former Welco Precision Products, Inc., which was also of Ferndale. These two constituent companies were controlled and operated by the present owners and directors of Syncro Devices, Incorporated.

The firm is now producing tools and parts for submarines, bombers, tanks, big gun PT boats, and precision machine tools, but the Syncro staff is interested—and will be after the war—in handling special engineering and production problems for manufacturers.

Syncro Device Plant



STAMINA - counts here!



WHEELS OF PROGRESS

Fractional Grades —
Controlled Porosity — H9 Vitrified Bond
— new improved hydraulic presses —
additional scientifically controlled
tunnel kiln — constant, rigid labora-
tory check of raw materials . . . These
important steps by BAY STATE assure
you of a continued supply of only
"thoroughbred" abrasive products to
help win your race for better delivery
dates and our ultimate Allied victory.

A 64-page booklet containing a wealth of data on
grinding wheels and other abrasive shapes is yours
for the asking.



BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

Precision Instruments Guard Quality of Aircraft Engines

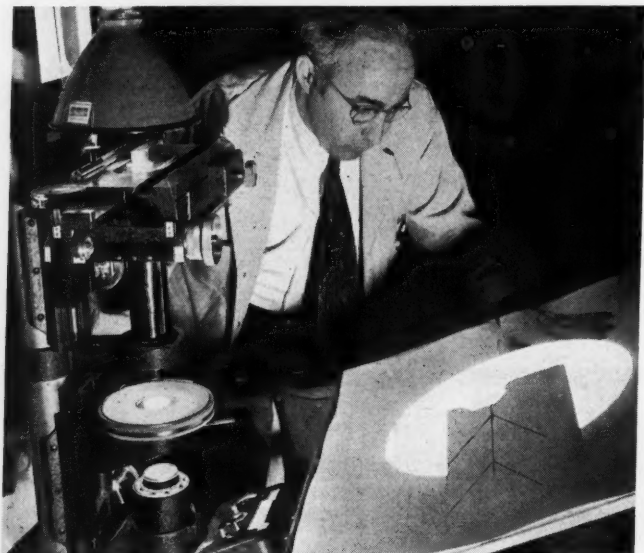
ROBOT policemen — master precision instruments measuring to the millionth of an inch — guard the quality and precision of aircraft engine parts as American manufacturers like Wright Aeronautical Corporation, of Paterson, N. J., turn out in quantity production the powerful engines for fast, long-range bombers and fighter planes.

To match strides with airplane construction, engine builders have had to achieve mass production and yet retain the quality, precision and

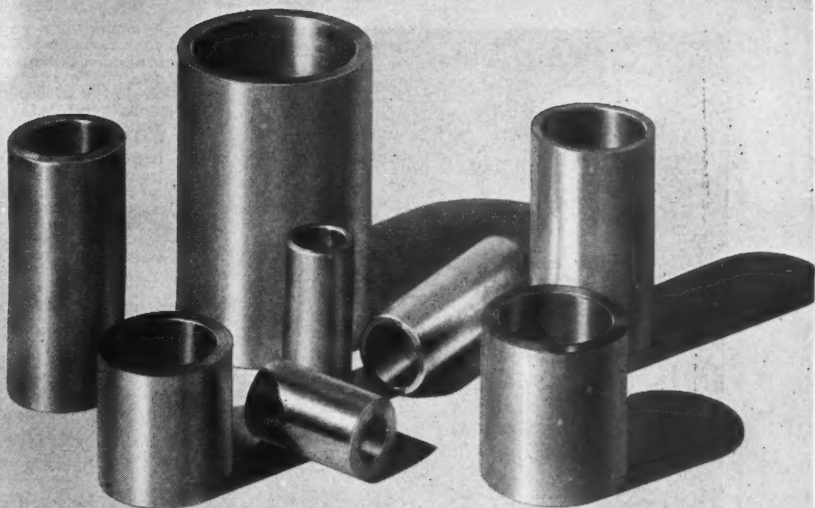
smoothness of finish which permits a single shaft to transmit as much as 2,000 horsepower to a propeller. In short, aircraft engines have to be giants in power, midgets in size and featherweights in poundage, as compared with massive engines of equal output designed for use in factories, locomotives or boats.

To produce power without massive weight, which would reduce the speed range and load of the plane, aircraft engines must be made of the highest quality materials available. As horse-

power goes up, quality must be



Master precision instruments such as the optical comparator are helping to build in the precision accuracy which makes possible mass production of powerful aircraft engines for bomber and fighter planes of the United Nations. Here in Wright aircraft engine plant, an inspector is shown checking the angles ground to the face of a cutting tool, as seen when magnified 25 times and the shadow reflected on the wire screen. This instrument can be used to magnify very small parts such as a gear tooth or thread to times normal size for visual comparison.



**Specifying *OD, ID and Length is not enough*
...you need proven serviceability too**

• Buckeye's 1088 stock sizes of fully finished ready-to-use phosphor bronze bearings—560 sizes of cored and solid, rough and finished 13' maintenance bars—Graphited bearings—and "Specials" in a wide variety of IDs, ODs and lengths to customers' blueprint, do more than meet mere dimensional requirements.

Buckeye are quality bearings—at standard prices—capable of giving a maximum of long, efficient, trouble-free service.

The outstanding performance of these bearings results from Buckeye's

skilful, experienced and painstaking manufacture. Through the use of virgin metals only, impurities in Buckeye bearings are held to negligible limits—and the complete laboratory and metallurgical control maintained over charging ratios, melting and pouring temperatures, and all other manufacturing processes assures the production of an exceedingly high quality of product—free from porosity—each piece of which month after month measures up fully to Buckeye's exacting specifications. No order is too big or too small for Buckeye.

Buckeye

BRASS AND MANUFACTURING COMPANY

BRONZESMITHS

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6412 HAWTHORNE AVE.

CLEVELAND, OHIO



**BRONZE SLEEVE BEARINGS • STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT
IN ANY RECOGNIZED BEARING METAL ANALYSIS**



A comparator gauge on which each division of the scale represents 25 millionths of an inch is one of the master precision instruments aiding aircraft engine manufacturers in machining parts to the accuracy needed in powerful engines for bombers, fighters and cargo and troop transports. This comparator gauge is set in a locked position determined by master gauge blocks. Then the gauge indicator shows the number of millionths the tool or production part varies from theoretical perfection.

building in the durability that makes possible sustained flight for hours on end calls for one essential: perfection in every part.

In the plants of the Wright Aeronautical Corporation, where Cyclone and Whirlwind aircraft engines are produced, the department has the function of passing judgment on the perfection of parts in every process

crease in direct ratio, for stress is greater. In engines designed for ground use, strength can be supplied by making parts larger and heavier; in aircraft engines, the strength must be supplied without the additional weight.

Wright Cyclones, for example, weigh only 1.1 pounds per horsepower. Outside the aviation field, the lightest engines weigh around five or six pounds per horsepower, while some run as high as 20 or 30 pounds per horsepower.

Metals must be of exactly the right hardness and toughness to withstand the stresses imposed on them. Running surfaces must be so smooth that no fatigue crack can spread from tiny scratches or tool marks. Dimensions must be accurate, not only for interchangeability of parts, but to prevent vibration and wear. Packing terrific power into a narrow diameter,

between raw materials and assembled engines. This department, known as the "Quality Control" department, uses a working language full of exact terms to define dimensions, shape, surface finish, subsurface quality, hardness, weight and performance—plus the two descriptive words "right" and "wrong." A term such as "almost correct" doesn't exist.

Stationed in every section of the Wright plants, the Quality Control inspectors use thousands of standard gauges and measuring instruments. These in turn are backed up, like the gold that backs up banknotes, by master instruments. With these the inspectors deal in terms of millionths of an inch when checking surface finishes, and use measurements as small as one ten thousandths of an inch in passing on the dimensions of highly stressed moving parts.

EVER LIGHT A TURRET LATHE WITH MATCHES?

That's what Walter Rabel
had to do before
they put in G-E
Fluorescent Lighting!



WALTER RABEL turns gear blanks on a turret lathe in one of the nation's vitally important subcontract shops.

BEFORE G-E FLUORESCENT LIGHTING was installed he had to light matches—even in the daytime—to see into the bore to make sure that the cutting tool was properly adjusted. Now with fluorescent lighting, the light is so well distributed that he can see the operation more easily and quickly.

IF YOUR SHOP NEEDS better lighting for war work and you have a suit-

able WPB priority rating, ask your G-E lamp supplier about installing fluorescent lighting in certified fixtures with G-E MAZDA F (fluorescent) lamps—the kind that stay brighter longer.

IF YOU CAN'T INSTALL better lighting now, you can make your present lighting do a better job by doing such things as: starting a regular cleaning schedule, using right size bulbs, installing supplementary lighting and so on. For specific information ask your G-E lamp supplier or your local lighting company.



G-E MAZDA LAMPS

GENERAL  **ELECTRIC**

One of the instruments used to measure in millionths is the "profilometer," a device which checks on surface finishes by probing, with a diamond-tipped finger, into scratches that are invisible to the eye. The profilometer is able to distinguish between two surfaces varying in smoothness by a millionth of an inch as easily as your hand can distinguish between a pane of glass and a picket fence.

When engine parts such as cylinder barrels are honed to a mirror finish, the steel surface appears absolutely smooth and even. Actually, however, tiny scratches a few millionths of an inch deep remain in the surface and it is up to the profilometer to determine whether or not their depths are within permissible limits. A diamond "tracer," the "antenna" of the profilometer, with a point having a contact area only 0.0000000003 of a square inch, probes the depth of each scratch. A fine steel spring applies the pressure of a small fraction of an ounce to the tracer, forcing it into every depression and the up and down

fluctuations of the diamond tip are picked up by a vacuum tube amplifier and passed to the needle of a dial indicator.

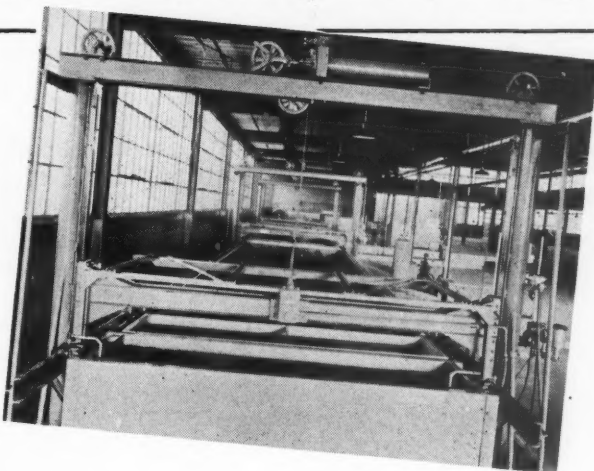
Oddly enough, profilometers not only determine whether finishes are smooth enough, but also indicate whether they are too smooth. If cylinder barrels are honed too finely, oil will not cling to the surface of the walls, and overheating results. Finish today is held at five millionths of an inch on the walls of cylinder barrels.

Real "G-man" instruments of the inspection corps are the magnetic inspection devices which ferret out "saboteur" flaws in highly stressed steel parts. In these tests, a steel part such as an articulated rod is magnetized and covered with a solution of oil and iron oxide powder. If the part is perfect, the iron oxide drains off with the oil. But any flaw or crack on or near the surface creates a break in the continuity of the magnetic field, forming a positive and negative pole on each side of the crack, even if the sides are jammed against each other. These poles, like the open ends of a horseshoe magnet, attract the grains of iron powder to the point of defect, outlining with a



The magic of magnetic inspection assures safety in all steel parts used in the production of Wright aircraft engines. Here, a crankshaft for a Wright Cyclone engine has been magnetized and is being drenched with a solution of oil and iron oxide powder. Use of highest quality steel usually produces flaw-free parts but if any minute crack should exist in the surface or sub-surface area—even if the edges of the crank are jammed together until they can't be seen with a magnifying glass—the iron oxide powder will outline the exact location and shape of the flaw.

How CURTIS AIR CYLINDERS Speed High-Production Finishing of Die Castings



Thanks to an ingenious application of several Curtis Air Cylinders, the automatic copper and nickel plating equipment of the Gerity-Adrian Manufacturing Corporation can now handle 270 racks of work per hour through five separate units.

Curtis Air Cylinders provide automatic transfer of work racks between the cleaning, plating, and rinsing units of the installation, which was installed by Crown Rheostat and Supply Company, Chicago. Each transfer unit is controlled by two Curtis Air Cylinders, one operating the lift mechanism vertically and the other operating the horizontal or transverse motion of the frame.

The installation eliminates lengthy drive shafts, affords any desired time cycle for the various steps in the transfer, and allows rearrangement of the entire sequence of operations at will. It greatly simplifies previous arrangements and has materially speeded up the production

of finishing huge volumes of die castings.

Curtis Air Cylinders will perform almost any pushing, pulling, or lifting operation. They cannot be damaged by overloading and are immune from abuse. They provide exceptionally accurate control; easily operated by unskilled labor.

Hundreds of industrial plants are saving time and money, speeding up production, with Curtis Air Cylinders. Write for free booklet, "How Air Is Being Used in Your Industry," and full information on Curtis air operated equipment.

CURTIS

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CURTIS PNEUMATIC MACHINERY DIVISION OF CURTIS MANUFACTURING COMPANY, 1913 Kienlen Avenue, St. Louis, Mo.

Please send me your free booklet "How Air Is Being Used in Your Industry" and further details concerning Curtis Air Hoists.

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black deposit on the surface the location and approximate size of the imperfection.

Every crankshaft, propeller shaft, articulated rod, master rod or gear—every steel part that has to withstand any stress—is magnetized and tested in this manner, thus singling out for scrap any black sheep that otherwise might slip through. This inspection cannot be used on aluminum or magnesium parts, since they are non-magnetic. X-rays are called into service on non-ferrous metals.

Whether of steel or non-ferrous metals, Cyclone parts have to be so perfect in size—within an extremely narrow limit of tolerance—that they are completely interchangeable between all engines of the same model. Consequently dimensions must come close to theoretical perfection, and the permissible variation from perfection is the "tolerance."

On Cyclone or Whirlwinds this tol-

Balanced weight, necessary to eliminate vibration in high-speed, powerful aircraft engines, is assured by this two-beam scale which indicates the weight at each end of a master rod for a Wright Cyclone engine. Total weight must not only be correct to the least fraction of an ounce but weight must be distributed to correctly balance the weight of the articulated rods which fit into the master rod and pass on 1,700 horsepower to the crankshaft.

erance may be as small as 0.0001 inch. Close fitting parts moving at high speed are machined down to these limits, to minimize wear and assure long service life. Where there are no high speeds and stresses, inter-

changeability is obtained by holding dimensions to a tolerance of at least plus or minus 0.001 an inch.

Sacred high priests of this dimension-measuring world are the master gauge blocks, little chunks of highly polished tool steel that are the present-day absolute maximum in accuracy of measurement short of using highly complicated light-wave instruments. So accurate are the blocks, and consequently so subject to slight expansion or contraction by heat or cold, that they must be used in a temperature of exactly 68 degrees Fahrenheit. Under such conditions they are accurate to within 0.000001 (two millionths) of an inch.

The master gage blocks are the supreme court of judgment for gages of all types used in the shops. In all Wright Aeronautical has about 120,000 different gages in use, as well as micrometers, squares, and so on. Periodically all of these gages are

Cut Faster . . Last Longer . . Economical

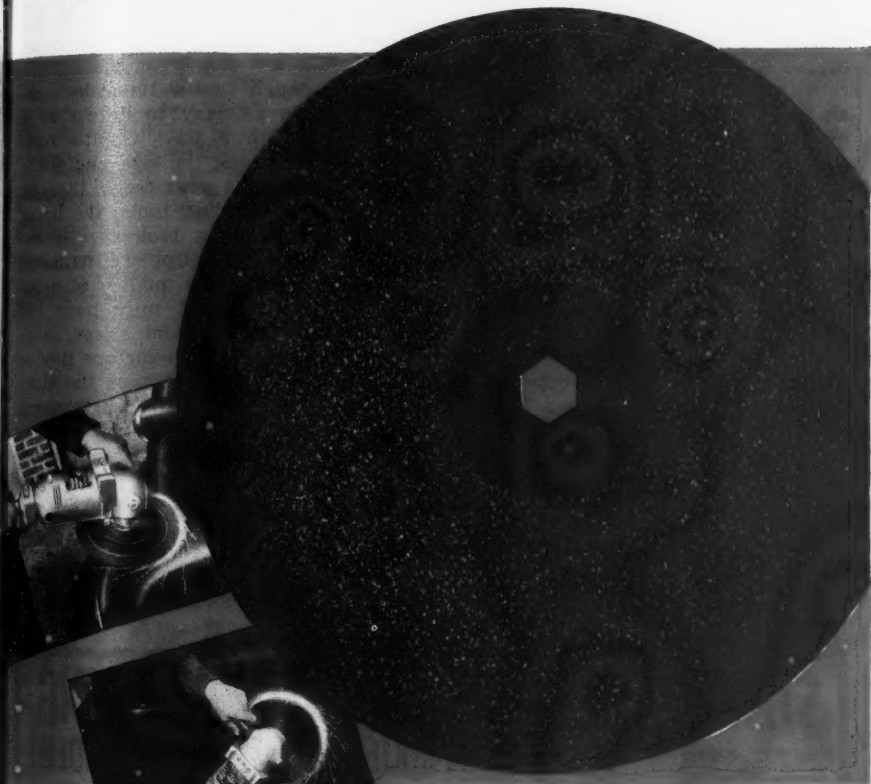
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PHENOL ABRASIVE DISC

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is sanding disc, even with continuous cutting action,
all run cool and clean. It reduces the drudgery of
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azing flexibility for concave, convex and reverse
urve sanding.

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STANDARD THE
ALBERTSON & CO., INC.



WORLD OVER
SIoux CITY, IOWA, U. S. A.

August, 1942

MODERN MACHINE SHOP 201

checked against the master blocks. For most production work, tool rooms in the shops have gage blocks accurate to within plus or minus 0.000004 an inch; sets accurate to 0.000008 are used on other "rough" work. For extra-fine work, however, or to check other blocks, a set in the two-millionths class comes out of the safe for measurements at a precise 68 degrees Fahrenheit.

In the same realm of measurement are the optical instruments. Just as a lens and a beam of light change a square inch of celluloid into the towering figure of Gary Cooper on a 30-foot theatre screen, so a lens and a light magnify some small part of an engine, such as an individual gear tooth, until a speck of dust on the part stands out like a bowling ball.

These optical instruments are known as "comparators," for they cast an enlarged shadow-profile of the part on a screen where it may be

matched, or compared, with a printed chart of the same part drawn on an enlarged scale. An error, when magnified as much as 100 times by comparators, is as easy to detect as a slice cut from a pie. Comparators are used to check the size and shape of such things as gear teeth, threads, cutting and grinding tools, the lip of a drill or a boring tool.

Another diamond-tipped instrument is used to check the quality of hardness. A metal part may have the correct dimensions and shape, with surface finish and sub-surface free of flaws, but it still must have the quality of strength in order to transmit as much as 2,000 horsepower. This strength is allied with proper hardness.

In testing, the diamond-tipped end of a plunger is pressed against the metal; the other end of the plunger is linked with a dial indicator on which a needle swings past a gradu-

SIMPLIFIED INTERNAL GRINDING with the MAJESTIC INTERNAL GRINDER



An exceptionally wide range of internal grinding jobs can be handled on the New Majestic Internal Grinder. Its simplicity of design and ease of operation are features of utmost importance in providing maximum grinding output at low cost.

SPECIFICATIONS

Length of table, 48". Swing over table, 10". Travel of cross slide, $2\frac{1}{2}$ ". Precision dial graduated to .0001". Precision bearing work head. Speeds — 100, 225, 350 r.p.m.

Write for complete details contained in New Bulletin

Majestic Tool & Mfg. Co.

2950 E. Woodbridge

Detroit, Mich.

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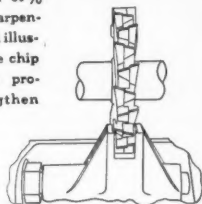
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FOR HEAVY SLOTTING..

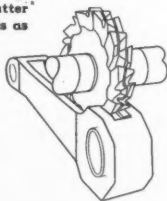
The sketch illustrates an example of deep slotting with a new B-C Interlocking Cutter. The piece is a cast steel transmission fork with a slot $1\frac{1}{4}$ " wide and nearly $1\frac{1}{2}$ " deep, removing $\frac{1}{8}$ " on each face. By changing from a herringbone type cutter to the new B-C Interlocking Cutter, production was materially increased with greater feed and speed, and the cutter, in addition, delivered 37% more pieces per sharpening. This is a good illustration of how free chip flow can improve production and lengthen cutter life.



NEW BARBER- COLMAN INTERLOCKING CUTTER

FOR DEEP BLIND CUTS..

This sketch illustrates how a new B-C Interlocking Cutter is successfully used in milling the slots on the master connecting rod of a radial airplane engine. This particular cut goes well into the shoulder of the rod, yet the cutter never hesitates or stalls as the cut gets deeper and heavier. Free flow of chips across the teeth permits new B-C Interlocking Cutters to handle jobs that would completely stop the ordinary type of cutter.



ADVANCED design produces an interlocking cutter having the advantages of a staggered-tooth type.

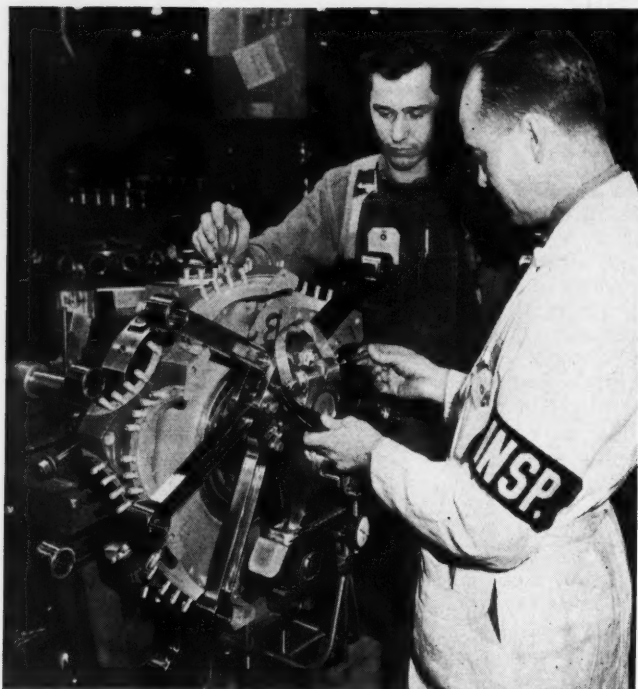
On the conventional interlocking side mill, the face edges form a vee which may pocket chips and cause early dulling. Now, with virtually continuous tooth edges, free flow of chips across the teeth is obtained, with much longer life for the cutter. Tools of this type are recommended for long deep slotting in steel, and are especially adapted to shoulder cuts. Depth of cut may be taken up to the hub in many cases, without stalling the cutter. For specific recommendations on this patented design and all other types of B-C Milling Cutters, consult your Barber-Colman representative.

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BARBER-COLMAN COMPANY

General Offices and Plant 207 Loannis Street, Rockford, Illinois, U. S. A.



Using a micrometer previously checked by Johansson gage blocks accurate to within two millionths of an inch, an inspector measures the amount of stretch in bolt fastening together two sections of the crankshaft of a Cyclone 14-cylinder aircraft engine. Under a pressure of 1,500 pounds the bolt is tightened until it stretches exactly 0.0001 inch. Extreme accuracy in tightening this bolt and in measuring its stretch is necessary to enable the crankshaft to transmit the 1,700 horsepower to the engine to the propeller.

chined to an exact weight—in addition to exact size—but every ounce of weight must be correctly distributed along the length of the rod. Re-

ated scale to record the depth of penetration of the diamond into the metal. The amount of pressure is fixed by counterweights. If the metal is soft, the diamond-tip penetration will be fairly deep—comparatively speaking—while in the ultra-hard steels the penetration will be very shallow.

The combination of push rod tip and valve tappet socket offers a good example of the value of this test. In the approximately 700 hours between overhauls, the top of the push rod will thrust against the valve tappet socket more than 36,000,000 times and do it without measurable wear, if the two units are of the proper hardness as proved by tests prior to assembly of the engine.

Balanced weight is another product of Quality Control. Master rods, for example, not only have to be ma-

son: to distribute weight correctly around the crankshaft and avoid vibration during operating speeds.

Two scales, set side by side, simultaneously check this weight distribution. A spindle on each scale replaces the usual platform. One spindle fits through the piston pin hole; the other spindle fits through the hole for the crankshaft, thus placing a known position of the rod on each scale. Pointers on dials indicate the amount of overweight at each end of the rod.

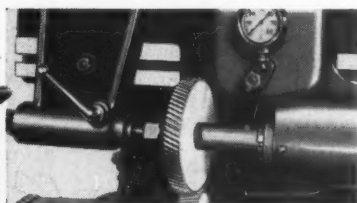
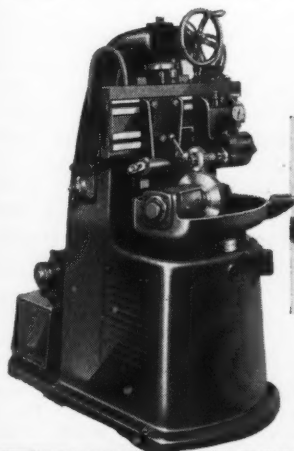
As for the inspectors themselves they are picked for education, vocational training, temperament, general health and eyesight. It's no job for a nervous man who dislikes details. All have their eyes tested periodically by portable equipment wheeled through the plants. Possession of healthy vision enables these inspec-

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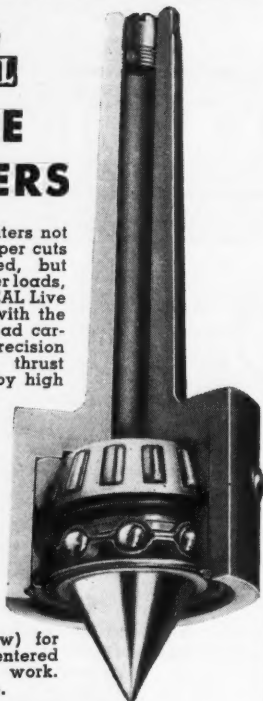
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tors to make astonishingly accurate visual checks, although even the sharpest-eyed have gages at hand to back up their judgment.

Inspectors wouldn't be needed, of course, if all parts were perfect. But some parts are rejected and the Quality Control department is almost fanatically careful about mutilating these parts so that they could never be used by accident in an engine. Small parts—perhaps a batch of gears not properly hardened—are dropped in acid for a few minutes, until they are so pitted and scored they could never be used. Larger parts of steel are thrust against an emery wheel and quickly and thoroughly mutilated. Magnesium or aluminum parts are bashed with a sledge hammer. All rejects are saved, however; the magnesium and aluminum parts for re-melt in Wright foundries, the others for return to steel mills.

The result of all this checking with standard gauges out on the factory floor and with master instruments in the tool cribs and laboratory? The result is over 600,000,000 miles of flight for the Cyclone 9's alone. The result is the word "routine" written on a flight engineer's report at the end of a 14,000-mile round trip on a trans-oceanic run, on a captain's report at the end of a transcontinental run, or in the log of a patrol bomber after sweeping ocean lanes for two days. That routine comes from the precision team work of design engineers—production engineers—and inspector.

"Boost Production" is the title of a six-page folder released by the Norton Company, Worcester, Mass., discussing the Norton "B-E" Bond Wheel and illustrating and describing its use in performing traverse cylindrical and through-feed centerless grinding operations and plunge-cut grinding operations. Copy free upon request.

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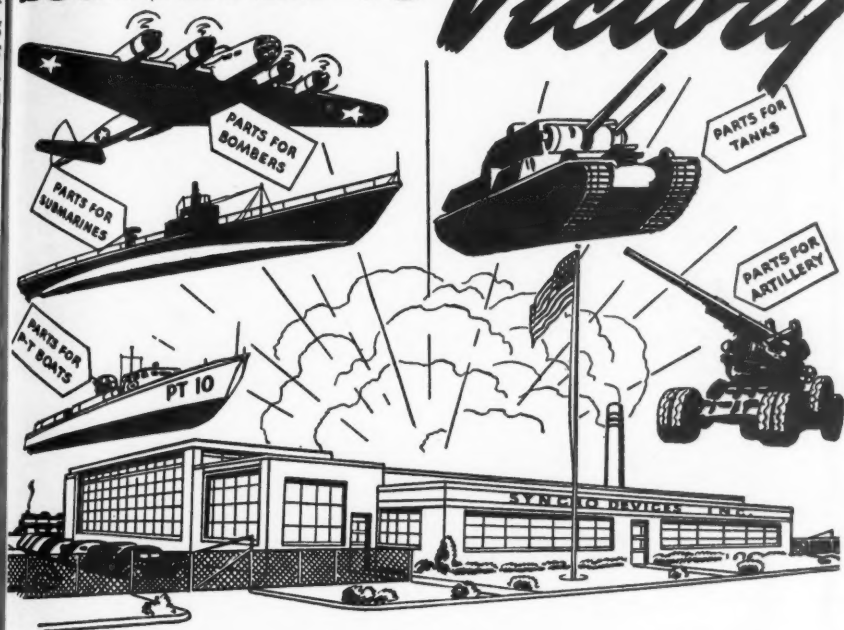
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August, 1942

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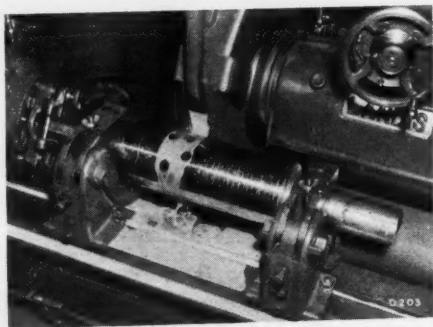
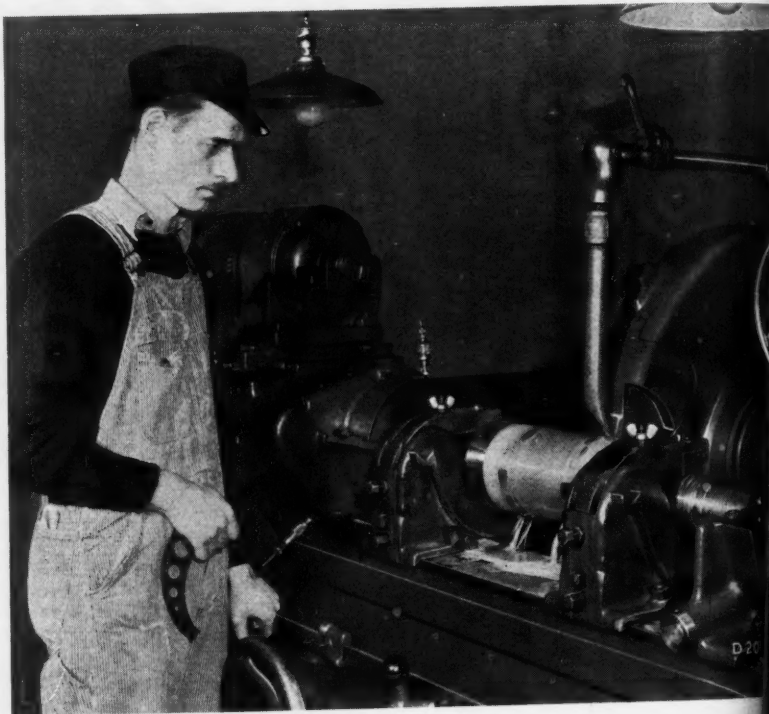
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TO FINISH THE JOB QUICKER...

ASSURE CONSISTENT



Above:—This Landis 10" x 48" Type C Grinder is installed in the plant of Allison Co., Connecticut. It is used for grinding of feeder rolls used in the manufacture of abrasive wheels.

Left:—A close-up of the operation above. Notice that the roll is not supported between centers, but instead is held by the roll heads and is driven by the head which is equipped with an equalizing mechanism. Close accuracy results.

*Unusual Performance
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PRECISION BY USING A LANDIS LIKE THIS

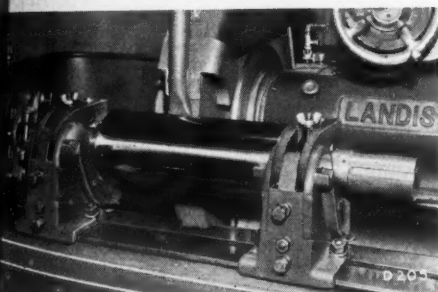
Why waste valuable time coaxing precision and rapid production from that old, out-dated grinding machine?

Why not assure yourself of consistent precision performance by using a Landis grinder for the jobs that are in hurry. Consider for instance...

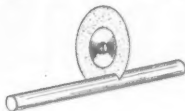
The Allison Company of Connecticut uses a Landis 10" Type C Plain Hydraulic Grinder for the grinding of roller rolls used in the manufacture of abrasive cutting and slitting wheels. Accuracy is of primary importance.

On the Landis grinder the roll diameter is finish ground within a limit of $\pm .001$ " and the entire length of the roll held within a tolerance of $\pm .001$ ". Nor is production sacrificed in order to obtain this precision. In spite of the close limits production has risen from 1 roll per 10 hour day to 4 rolls per 8 hour day.

You can depend on Landis grinders for precise, productive performance—all of the time. YOU profit only when takes place in your plant.



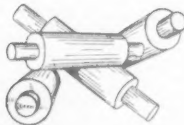
File No. 203 THIS IS THE STORY



The Allison Company, Connecticut, manufactures abrasive cutting wheels used to cut or slit metal, glass or ceramic products. These wheels are made in diameters of from 1" to 20" and in thickness from .015" to 1/4", however, certain special wheels are now being made that are held to the almost unbelievable size of .005" in thickness.



In making these wheels, feeder rolls are used to roll out the processed abrasive impregnated rubber to its final thickness. Because the accuracy of the wheel is determined by the rollers, precision is highly important. The Allison Company is the only firm in the world that makes abrasive wheels within such close tolerances.



Concerning the performance of their Landis grinder the Vice President of The Allison Company says, "It has satisfactorily met every requirement of fast and accurate work demanded of it." This company knows that their grinding machine can be depended upon for consistent precision grinding at a high rate of production.

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA



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HYDRAULIC
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HYDRAULIC
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IDEAS FROM READERS

Fixture for Holding Thin Brass Rings for Grinding

By W. M. HALLIDAY
England

AS IS well known, the magnetic chuck affords a simple, rapid, trouble-free method of gripping and holding thin rings, washers, and similar parts so that the sides can be ground parallel. This method is applicable, of course, only when the workpieces are made of magnetic materials such as iron or steel; when

the workpieces are made from non-magnetic materials such as brass or bronze the chucking becomes a problem. Some means must be found to obtain an effective grip on the work.

The drawings show a simple quick-acting fixture which was designed by the writer to overcome the problem of chucking thin brass rings of the type shown in Fig. 1. It will be noted that the ring has an eccentric oil groove in each side face.

The drawing Fig. 2 shows plan and side elevations as well as a sectional view of the complete fixture. The part B is of mild steel, and is long enough to accommodate at least three rings with ample margin at each end. If desired, however, the base could be made any length desired to hold any number of parts.

The rectangular part B is ground flat and square on each side, with the sides parallel. Three holes are bored through this part in a vertical plane to receive the sliding studs C. The holes should be located far enough apart to ensure a small amount of clearance between the edges of adjacent rings when in place.

The conical head studs C should be made to a sliding fit in the holes, for which it will be necessary to bore the holes and grind the shanks of the studs. The diameter should be kept as large as possible; probably not less than $\frac{1}{8}$ inch. The conical head must be concentric with the shank.

The part D is a split spring ring

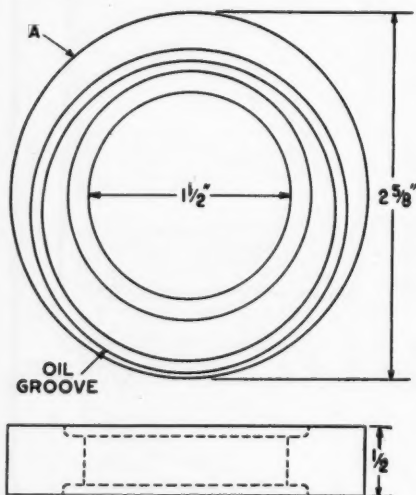


Fig. 1—Drawing of Brass Ring for Which Grinding Fixture Shown in Fig. 2 was Made

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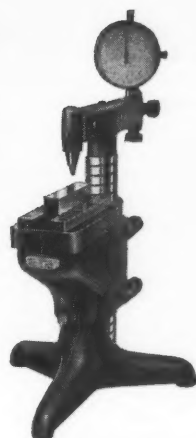
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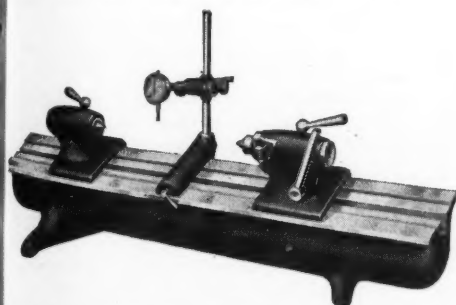
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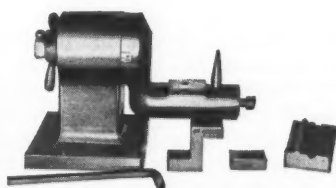
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bored to fit the shape of the stud-head around which it fits. The O.D. of the ring should be made 0.005 inch smaller than the diameter of the bore in workpiece **A**, and the thickness of the ring should be approximately 1/64 inch less than the finish thickness of the smallest ring to be ground. This spring ring is of the common type,

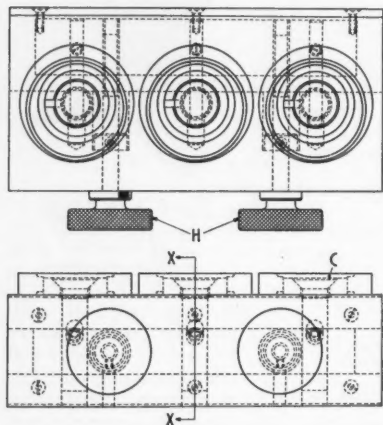
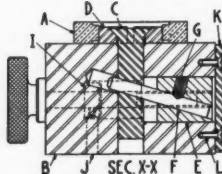


Fig. 2—Drawing of Fixture for Holding Brass Rings on Magnetic Chuck for Grinding Sides Parallel



having a cross slot completely through one wall of the ring.

Centrally located on the rear side of the base **B** and extending the full length of the base is the parallel slot for receiving the slide **E**, which latter is a sliding fit in the slot. The slide should preferably be of cast iron or brass, ground dead square and flat on each side. The depth of the slot in base **B** should extend a short distance beyond the edge of the vertical holes provided for the studs **C**.

Affixed securely to slide **E** are the angularly-located operating pins **F**, held in position by the locking set-screws **G**. Where each slot breaks through into the vertical hole, adequate clearance should be provided for the passage of pin **F** as slide **E** is moved backward or forward. Clearance must also be provided for the front end of each pin by drilling three

holes in the opposite side of the base **B**, these holes being located at the same angle as that of pins **C**.

The purpose of slide **E** and the angular pins carried therein is to actuate studs **C** vertically, which is achieved by drilling a hole through each stud of the same diameter as that of the pin and reaming to a sliding fit. As slide **E** can only move in a horizontal plane, the passage of pins **F** through the holes in studs **C** impels the studs to move upward or downward according to the direction of travel of slide **E**.

Slide **E** is actuated by means of two knurled head screws **H** which are made turning fit in plain holes drilled through base **B**. It will be noticed that these holes extend into the slot and are counterbored for a short distance on the inner side. Inside this counterbored portion is a small check collar **I**, which is secured to shank of screw **H** by a small set screw. The collar should be locked in position, permitting screw **H** to be easily turned, but with no endwise movement. The hole **J** is necessary so that a screwdriver can be applied to tighten the setscrew in the collar. The threaded end of the screw engages a tapped hole in slide **E**, as shown.

The part **K** is a cover made from mild steel plate, of almost the same overall dimensions as the rear surface of base **B**, to which it is secured by six small countersunk screws **L**. The cover prevents grinding dust, dirt, and oil from the working slide **E**.

Welded STEEL Machine BASES

Size

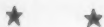
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IN Mahon QUALITY**

Fabrication of even the simplest machine base requires a high degree of ability and experience if accuracy is to be assured. But, when it comes to the big, complicated job—it takes EXTRAordinary skill and equipment. The huge Base, pictured here, is typical of many such intricate designs produced by Mahon, most of which are repeat orders from customers of long standing. But, remember, SIZE makes no difference in Mahon quality—the same excellence of workmanship goes into the building of every Mahon Welded Base—large or small—simple or complicated. If you demand Bases that dovetail in accuracy and quality with the machines for which they are built, let us quote on your requirements. Your blueprints will be figured promptly. Deliveries will be made as promised.

THE R. C. MAHON COMPANY
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Manufacturers of Machine Bases
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Fabricated Steel Products.

MAHON



In use, the fixture is first held on a magnetic chuck in the usual manner, then the screws **H** are adjusted so as to raise the studs **C** slightly, thereby releasing the spring rings **D** and allowing the rings to close. The rings **A** may then easily be slipped over rings **D**. Then, with all rings in contact with the top face of the base **B**, the screws **H** are turned in the opposite direction, causing studs **C** to travel downward. As the conical heads of the studs engage the spring rings **D**, the rings are sprung open, gripping the workpieces **A**.

If the angle of pins **F** with slide **E** is in the region of 15 to 20 degrees, the amount of turning movement applied to screws **H** will be slight; thus the workpieces can be locked or released by a relatively slight movement.

By making up a number of sets of split rings **D**, the sets differing only in the matter of outside diameters,

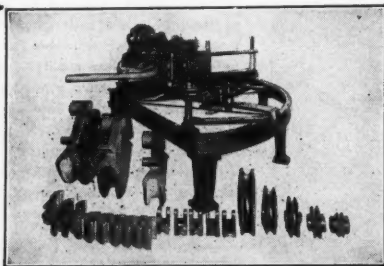
provision can be made to hold a variety of work on this fixture.

Micrometer-Type Adjustable Boring Bar

By J. A. HONEGGER

THE drawing shown here presents a radical departure in the design of an adjustable boring bar, in that all adjustment for the tools is made by simply revolving the micrometer barrel **A**, which barrel is located at a considerable distance from the point of the tool. Another departure consists in that a wider range of adjustment is possible for the cutting tool, thus reducing the number of bars required to cover a wide range of work.

The part **B** is the bar proper, in the end of which the T-slot-shaped guide way **C** has been milled. On the cen-



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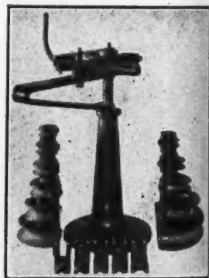
Three New Machines: No. 1—For bending extra heavy pipe up to 3 in. No. 2—For bending all kinds of thin gauge tubing without use of mandrel. No. 3—For bending IPS conduit.

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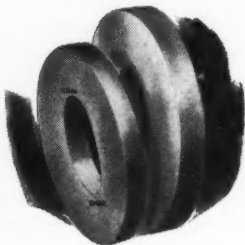
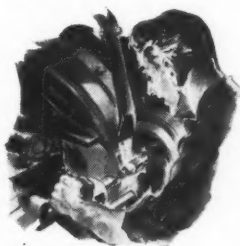


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The flimsy crates of World War I needed overhauling after as little as 24 flying hours. But today's planes fly hundreds of hours at much higher speeds before a major overhaul. The reason? New materials, new designs and new methods of finishing metal surfaces. Finishes so nearly perfect that bearings, cylinders, pistons and cams are made practically wear-proof! It's a process in which Carborundum has played an important part...by supplying the finishing wheels and stones required.

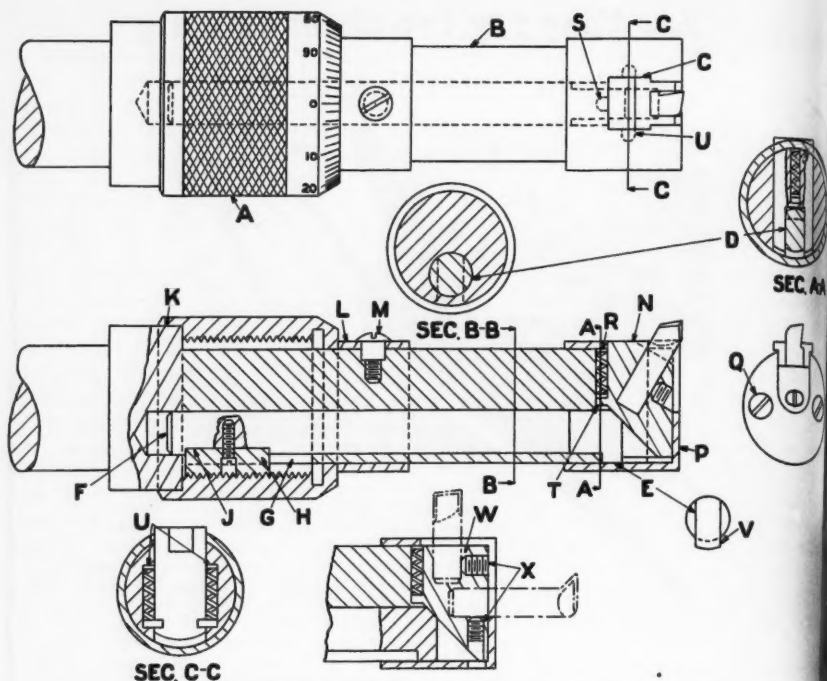
Formerly ultra-finishing was a long tedious task. But thanks to the new process, finishes accurate to a few millionths of an inch can now be produced on ground surfaces on a production basis. Application of these finishes to wartime engine production has improved the fighting efficiency not only of planes, but of tanks and other motorized equipment. Fewer men are needed for maintenance and repair.



Ultra-finishing with extremely fine grit wheels—as fine as 600 grit—is only one of many ways in which Carborundum may be able to help you save precious time. If you have a production problem that abrasives might solve, write The Carborundum Company, Niagara Falls, New York.



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Drawing Illustrating Design of Micrometer Type of Adjustable Boring Bar

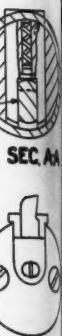
line of this slot, at **D**, a hole is drilled and reamed for the wedge bar **E**, which terminates at **F**. At **G** a slot is milled into the boring bar for the adjusting key **H**, the key being held in longitudinal position by inserting it into the stepped slot **J** of the wedge bar **E**.

The barrel **A** is threaded onto the adjusting key until the shoulder **K** rides on the larger diameter of the bar. Stop collar **L** is then slid into place and fastened in position by the use of the three threaded studs **M**, which are located 120 degrees apart. Tool slide **N** next slid into place and the wedge bar **E** is receded until the tool slide comes flush on both sides of bar **B**. Tool slide **N** is of such length that when the wedge bar is in the position to which it has been receded, the slide and bar are flush. This al-

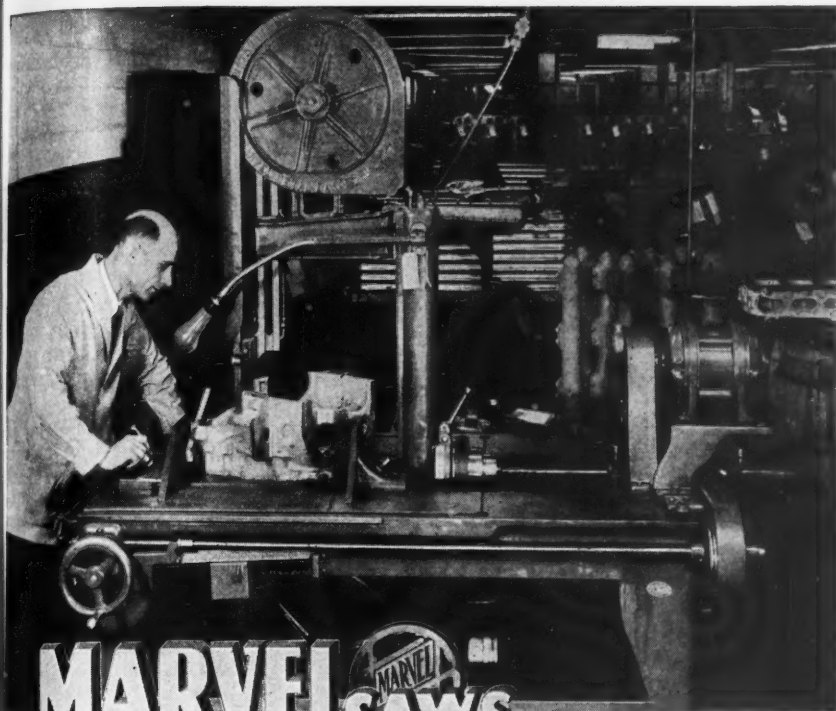
lows the retainer cap **P** to be slid into place, where it is fastened by means of the two flat head screws **Q**.

Previous to sliding the retainer cap into place, however, a spring **S** is compressed into the slot **S**. The spring rests upon the heel **T** of the slide **N**. This heel can be either part of the slide proper, or an inserted piece. The spring must be sufficiently strong to prevent the slide from weaving, as well as to eliminate all backlash from the slide back to the barrel **A**. One such spring is not sufficient, additional springs can be added, one on each side of the slide as shown in the cross section detail. Adding two in this manner will make a total of three springs, which should exert all the pressure necessary to hold the tool slide rigidly in place.

The tool slide **N**, as will be noted



SEC. AA



MARVEL SAWS

Photograph courtesy Packard Motor Car Co.

A MARVEL No. 8 Speeds All-out Production of Packard Rolls-Royce Aircraft Engines

MARVEL Sawing Machines are playing an important part in speeding production for National Defense. Not only the MARVEL 6A and 9A High-Speed Production Saws that automatically cut-off rifle barrels, gears and parts from bar stock in great quantities; or the giant MARVEL No. 18 Hydraulic Saw so well known for its cutting Speed; but all other MARVEL Saws, too, each in its own way, are at work in America's "all-out production." Take for example, the MARVEL No. 8 Universal Band Saw illustrated above, working on aircraft engine crankcases in the "D" Division of the new Packard Rolls-Royce Engine Plant.

Because of its large capacity (will handle work up to 18" x 18") because it cuts at any angle from 45° right to 45° left; and because the blade remains vertical throughout its straight-forward carriage travel, the MARVEL No. 8 will do trimming, notching, mitering and cutting-off, and will save hours of machining by roughing out work to size and shape.

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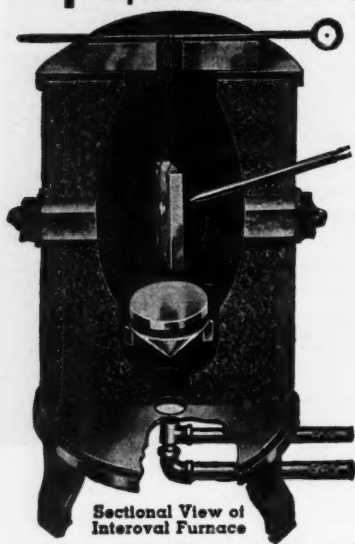
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No possibility of surface decarburization or distortion. Heat treats "Moly" steels without any trace of scale or soft skin.

This gas-fired furnace operates at 25c per hour for fuel. Heats to 2350° F. in 40 minutes in a non-oxidizing atmosphere. May be quickly converted into lead, cyanide or soft bath furnace.

Heating chamber—14" high, 9" in dia. at center, 7" at top.

WRITE FOR NEW FOLDER.

BENNETT
INSURED STEEL TREATING CO.
130 SOUTH ST. NEWARK, N. J.

in section A—A, has a bearing through the complete width of the bar. The center of the slide is milled out on a 45-degree angle, as shown in the sectional elevation. This angular surface rests upon a corresponding angular surface on the wedge bar E. The heel V of wedge bar E is upset and then machined to the same radius as the boring bar B, and the same diameter. This construction is intended to eliminate springing in the wedge bar by allowing it to rest against the inside of the cap P, which backs up the bar.

The tool slide shown at W is designed so that a boring tool can be inserted either at the front end or at the side. When the range of the tool has been reached with the boring tool in the front position, it can be moved to the side position, the slide retracted, and then advanced again until the range of adjustment has been reached. In either position the tools are clamped by the screws X.

Cutting Circles in Sheet Metal with a Chisel

By A. H. WAYCHOFF

WHEN it is necessary to cut a circle in sheet metal with a chisel, or to cut out a disc, better results can be obtained by tying the chisel to the center of the circle than by trying to follow a line that has been drawn with a scribe.

To "tie" the chisel to the center, punch or drill a small hole and insert a very small screw through the hole, then fasten one end of a length of fine wire to the screw and the other end around the chisel, as shown at A, taking care to make the wire just long enough so that the chisel will be held at the required distance from center. The wire will hold the chisel at an even distance at all times, and

Announcing
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WELDERS
by
PROGRESSIVE

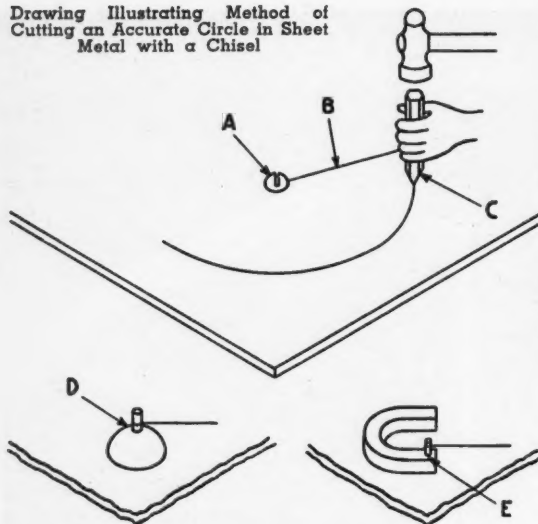
From the largest producer of spot-welding gun-equipment you can now also obtain the most modern of Seam Welders. The complete line comprises 126 models including circular (transverse), straight (longitudinal) and Universal (illustrated) Seam Welders.

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PROGRESSIVE WELDER CO.
3050 E. OUTER DRIVE **DETROIT, U. S. A.**

Drawing Illustrating Method of Cutting an Accurate Circle in Sheet Metal with a Chisel



Besides, the job can be done in much less time.

If a hole in the center of the piece is not permissible, a vacuum cup can be used to hold the wire, as shown at B, or the wire can be attached to a pin in a magnet, as shown at E. An old magnet taken from a discarded magnetometer will serve the purpose. If a magnet is used, a small hole should be drilled for a drive fit for a small pin, as shown.

Three-Quarter Center

By F. J. WILHELM

ensuring an even line instead of the wavy line which usually results when an attempt is made to follow a line.

THE writer has found that a three-quarter center is more efficient than the usual half center, for several reasons. The three-quarter center has a greater amount of bearing



Drawing of Three-Quarter Center

in the work, consequently it will not wear the center hole in the end of the piece as quickly or easily. The three-quarter center will last much longer than the half center, and is practically as easy to make. The drawing shows the design of a three-quarter center.

Artus Spacers. Industrial Products Suppliers, 6 Broadway, New York, N. Y., has prepared for free distribution a page folder containing complete tabular information on Artus Milling Cutter Spacers of synthetic resin. The company also has available free of charge a color identification chart for Artus spacers.

EASIEST WAY

TO HOLD TOLERANCES!

Here's How to Do It!



The Ziegler Floating Holder produces unbelievable accuracy in tapping and reaming—on old equipment as well as new—because it automatically compensates for machine spindle misalignment, eliminating oversized or bell-mouthed holes. Furnished with male or female taper—and straight, threaded or special shanks to fit any machine used for tapping or reaming.

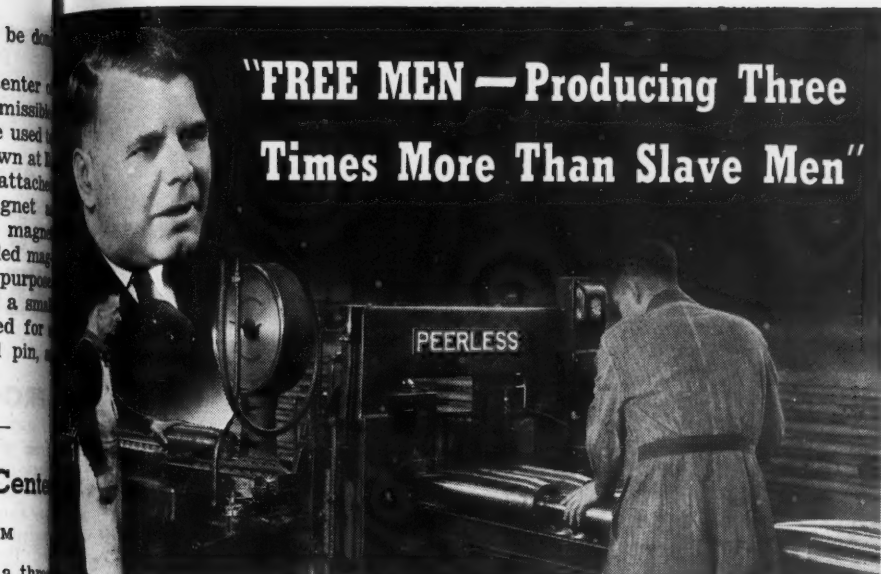
W. M. ZIEGLER TOOL CO.
1920 12th St., Detroit, Mich.

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DRIVE

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American tools and free Americans have created a miracle of mass war production . . . have set an impossible pace for Axis slaves to follow. To help these free men produce, Peerless has made practical the faster cutting of metal.

PEERLESS 14" High Duty Saw, cutting butt end from 155 mm semi-finished shells. As many as 800 pieces are cut with a single, high-speed, 4 tooth, \$1.50 blade.

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These savings in TIME . . . METAL . . . and BLADES are helping free men to win, and to buy their War Bonds every pay day. More complete details on this 3-way saving will be mailed at your request.

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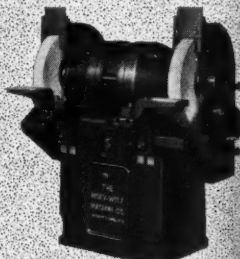
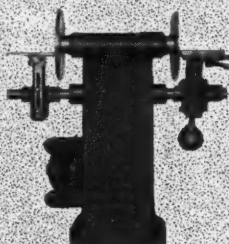
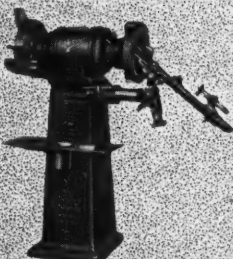
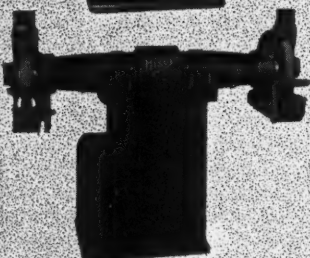
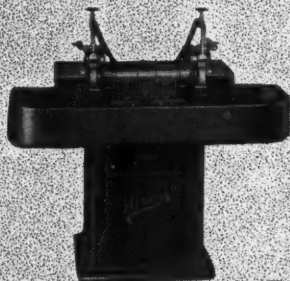
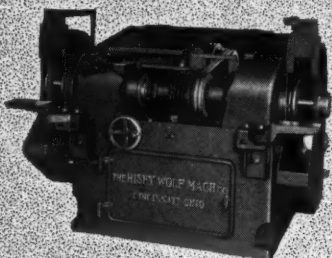
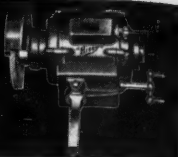
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Wet Grinders and Dry Grinders
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Hisey Catalog No. 60CM lists more than 200 different types and sizes of Grinders from $\frac{1}{4}$ to 25 H.P. capacity.

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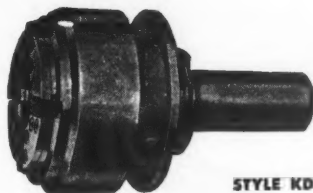
Also a complete line of Buffing and Polishing Machines in direct drive and V belt drive models.

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ROTARY DIE HEADS

If you want a tool for fast production and long life under high speed rotary threading, you will want to consider the Geometric Style KD Die Head. It is noted for its rugged simplicity and compactness, and can be used on Live Spindle and Automatic Screw Machines in the limited space allowed for threading tools.



If you want a tool that adjusts to size quickly, does close to shoulder threading, and cuts accurate threads . . . If you want a tool strongly backed by solid metal at all points of wear and stress, with chasers rigidly supported . . . a tool that will give you long service — specify Style KD.

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Write for our KD Booklet.

Make our 45 years of experience your profit!



THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN.

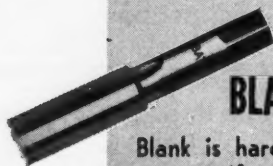
We're Making Haste Slowly

We're using every means at our command to fill your orders for Bath Taps. But we will not sacrifice quality to meet this demand. Bath Taps are still "ground from the solid **after hardening.**"



BAR

Steel bar is cut off, centered, turned; flutes are milled; tap is squared and stamped.



BLANK

Blank is hardened in the solid to assure uniform metal structure from core to cutting edge.



TAP

Shanks, major diameters and flutes are ground on centers. Then, threads are ground from the solid on Bath patented equipment.

RESULT: *Accurate,
hard, long wearing tap.*

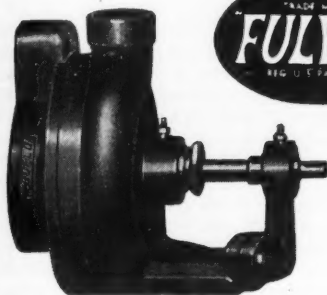
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CENTRIFUGAL COOLANT PUMPS

Numerous models . . . belt-driven or direct connection to motor . . . afford you wide variety of adaptation to your particular effort.

Sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ "

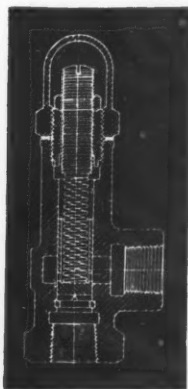
Illustrated Model FR54



BY-PASS OIL-RELIEF VALVES

Piston type . . . Non-chattering

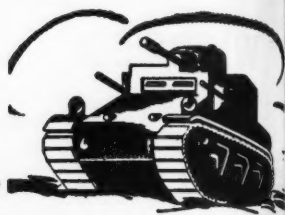
Standard type for constant pressures. Pipe sizes $\frac{1}{4}$ " to 2" for pressures from 0# to 350# with five different springs for pressure variation. Require practically no attention after installation.



Please write for bulletins



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BLANCHESTER, OHIO



Tools For National Defense

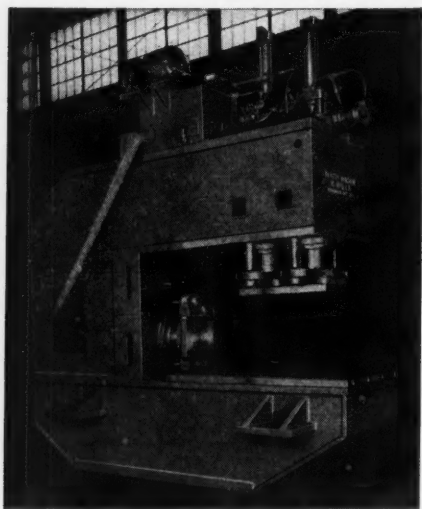
Beatty Hydraulic Forming and Flanging Press

Designed for use in the building of ships, tanks, trucks, railroad cars, and so on, the Beatty Hydraulic Forming and Flanging Press illustrated herewith has been introduced by the Beatty Machine & Mfg. Co., Hammond, Ind. The machine is available in capacities up to 400 tons and features a self-cooling hydraulic oil system designed to eliminate the need for cooling coils.

The hydraulic oil circuit is so arranged

that the two vertical cylinders of the press, each of which has a 200-ton capacity, can be connected together and the press operated as a single 400-ton unit with control by a single lever. When used for flanging, the front cylinder advances to the work on the downstroke at a rate of 290 inches per minute and holds the work under pressure while the horizontal ram advances at the same rate. Under a full load, this ram presses at a rate of 21 inches per minute. All cylinders are controlled by manual valve lever.

Additional specifications of the 400-ton model press illustrated herewith are as follows: maximum daylight of press, 48 inches; stroke of cylinders, 24 inches; depth of throat, 66 inches from center of vertical cylinders to housings; lower platen, 48 inches right to left, 88 inches front to back.



Beatty Hydraulic Forming and Flanging Press
Designed for Use in Building Ships, Tanks,
Railroad Cars, Etc.

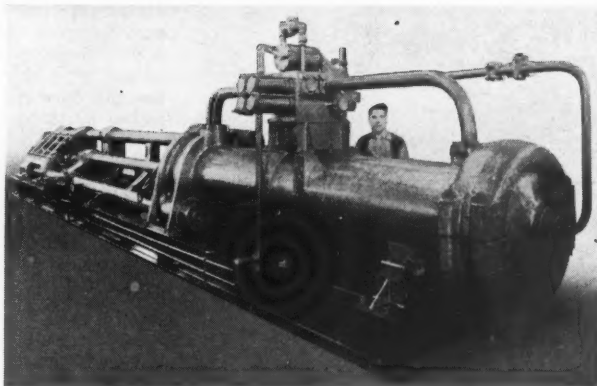
Baldwin Southwark Horizontal Hydraulic Double-Acting Draw Press

The horizontal hydraulic double-acting draw press shown herewith, product of the Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia, Pa., is designed for use in the production of 155 mm. shell forgings. The press, which is of 200-ton capacity, is equipped with four die heads and one stripping head. The extreme end of the piston of the press is supported by a well-guided

Baldwin Southwark Horizontal Hydraulic Double-Acting Draw Press

crosshead having adjustable shoes on the two press columns. The drawing mandrel extension is guided in a bronze lined casting.

The machine is mounted on a structural steel bed and is provided with a four-way operating valve which, together with piping, is mounted on the top cylinder. A pilot valve for operating the main valve is conveniently located on the press. The machine has a stroke of 11 feet, the piston of the press being 19 inches in diameter and the piston rod 14 inches in diameter. The floor space occupied by the machine is 45 x 6 feet.



Acromark No. 926 Bench Marking Machine

Designated as the No. 926, a hand-operated bench marking machine designed to mark 650 or more shell noses per hour is now being offered by The Acromark Corp., 9 Morrell St., Elizabeth, New Jersey.

The cast iron hollow base of the unit



SAFETY

ACCIDENTS can be far more costly than inefficient machine operation. Extra Safety is built into MARSCHKE Grinders. Work rests of Pedestal and Stand types are mounted on alloy steel wheel guards. In adjusting rests, the operator automatically rests spark shields to hug the wheels.

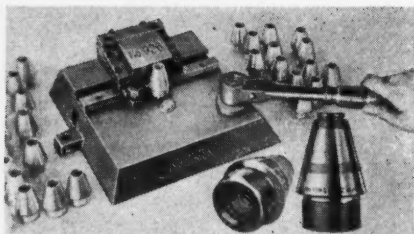
Cover flanges keep sparks and chips inside the guards.

Safety is one of the eighteen features accounting for Marschke's superior grinding efficiency. Study these in Catalog showing 70 MARSCHKE Grinder and Buffer specifications, 1 to 25 H.P. Write for Catalog TODAY.

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1804 MADISON AVE., INDIANAPOLIS, IND.

These safe Marschke Alloy Steel Universal Guards are adjusted without tools.

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Acromark No. 926 Bench Marking Machine

encloses a reduction gearing to the operating hand lever and a gear and rack arrangement to rotate the part to be marked in perfect unison with the straight-line interchangeable type holder, which is located at an angle on a slide with adjustable gibs. In operating the unit, a smooth movement of the slide rolls the straight-line characters into the tapered part of the type holder.

According to the manufacturer, the Acromark No. 926 Bench Marking Machine can be used to mark one or two lines without distortion and without undue effort on the part of the operator.

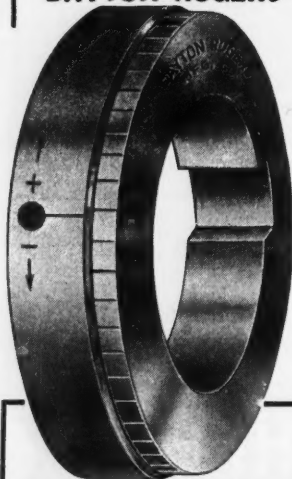
Mandrels can be interchanged for accommodating different sizes of parts, and a double screw arrangement at the base of the type holder permits the holder to be slid forward or backward for regulating marking depth.

G-E "Light Watchman" Photoelectric Relay

A photoelectric relay especially designed for turning off protective lighting around plants during blackouts, is known as the "Light Watchman," has been announced by the General Electric Co., Schenectady, N. Y. The relay, which is available in indoor and outdoor types, is designed for actuation by the nearest street light. Thus, when the light is extinguished at the start of a blackout, the relay turns off the lights in the protective lighting system. When the street light is turned back on, the controlled lights are again energized.

The G-E Light Watchman Photoelectric Relay

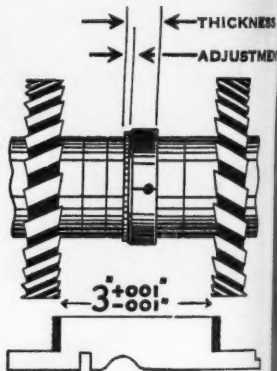
S-P-A-C-E Milling Machine Gang Cutters to .00025" with DAYTON ROGERS Micrometer Adjustable Spacing Collars



Merely loosen cutter arbor nut to adjust collar by thousandths or quarter-thousandths.

Designed for accurate spacing of side milling cutters, gang milling and other multiple milling set-ups.

WRITE FOR
DETAILS



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2830 13th Ave., S. Minneapolis, Minn.

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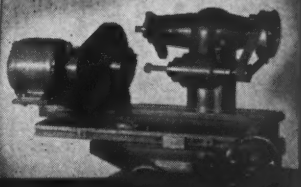
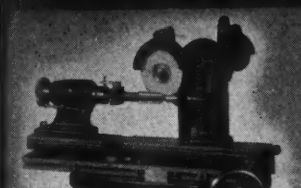



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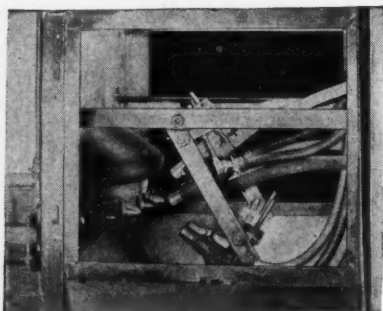
August, 1942

Rotorex GRINDER
FOR ALL TOOLS

PROMPT DELIVERY
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DOUGLAS MACHINERY CO.
150 BROADWAY NEW YORK, N. Y.



AMMUNITION SHELLS CLEANED

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SAND BLAST

Complete outfits for shells of all calibres—also for all classes of work in metal, plastics, glass, composition, bakelite, etc.

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**167-2 Christie St.
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tric Relay is said to be highly directional, thus making it subject only to the control of the street light at which it is aimed. A short time delay prevents false operation of the relay by momentary flickering of street lights. In addition, the relay is so designed that if either of the two tubes of the unit fails or if the sensitive relay coil is open-circuited, the



G-E Outdoor Type "Light Watchman"
Photoelectric Relay

relay is de-energized and the lights are turned off. The manufacturer also states that the operation of the device will not affect the normal functioning of a time switch used to turn on the lights at dusk and turn them off at a preselected time.

Force Interchangeable Die for Marking Aircraft Instrument Dials

An interchangeable die for marking aluminum aircraft instrument dials is now being marketed by Wm. A. Fox & Co., Inc., Brooklyn, N. Y. Designed for use in a hydraulic press, the die is constructed to mark workpieces accurately at a rate of approximately 200 pieces per hour.

MASTERDRIVES

**ARE SIMPLE AND COMPLETE—REPLACE
SEVERAL IDLER PULLEYS—IMPROVE
PERFORMANCE OF BROWNE & SHARPE
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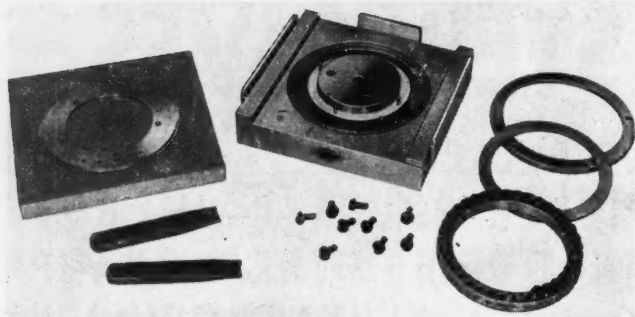
• Install Masterdrives on your Browne & Sharpe and similar surface grinders, to simplify the drive and save maintenance expense. Each drive is engineered as a complete unit, ready to install over the studs on the base of the machine. No machine work needed. Proper belt tension is maintained at all times in service. Unique mounting permits motor to rotate about a fixed support, counter-balanced by an adjustable tensioned spring. If belt fails, motor drops slightly to point where increased spring tension supports it . . . MASTERDRIVES supplied in 550 specifications for practically every machine tool drive requirement.

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INDUSTRIAL EQUIPMENT DIVISION • DAYTON, OHIO



Force Interchangeable Die for Marking Aircraft Instrument Dials

Breuer "Tornado" Air-Raid Siren

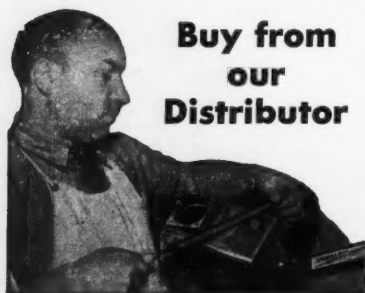
To provide air raid protection for employees in industrial and power

Interchangeable type provides for replacing single characters or resetting all characters with ease and speed. Die holder rings are changeable; the same die may be used to mark different dials or to mark the same dial with different spacings. Pilot pins position the workpieces radially and concentrically to ensure accurate location of the impressions. Bearer bars control depth of impression, and hardened impression pads provide uniform depth of impression over long periods of die use.

plants, office buildings, warehouses, mills and factories, the Breuer Electric Mfg. Co. 5100 Ravenswood Ave., Chicago, Ill., has brought out the "Tornado" Air-Raid Siren shown herewith, which is specifically designed for industrial use. The siren is available in two models, one for use in small departments, offices, laboratories, stock rooms, and so on, and the other and larger model for use in manufacturing areas, this latter model, it is claimed, being definitely heard above the usual din of machines at work.

PRECISION FILES

that speed production



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The sharp, accurate, uniform teeth for which "American Swiss" Swiss-Pattern Files are famous require accurate cutting equipment and a high degree of skill. Standard available tools could not produce the fine workmanship which we demand for our files, so we have developed special etching tools for the purpose. The men who operate these tools must be experienced, deft, patient . . . and they are. It is this care in methods and men, applied to the highest quality of material, that has built up the reputation of "American Swiss" Files as the preferred precision tools for intricate and accurate filing.

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CERTAINLY MID-WEST honing stones cost more than average abrasives! But if you're looking for quality MID-WEST produces it.

An average honing stone does average work. MID-WEST stones, on the other hand, mean economy of time and labor because they are manufactured with Micro-Bond, a remarkable new abrasive agent that positively assures more efficient, longer life.

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"TRUMORE" DIAMONDS

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long, natural dia-
mond.

Never wears dull.
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Furnished in any
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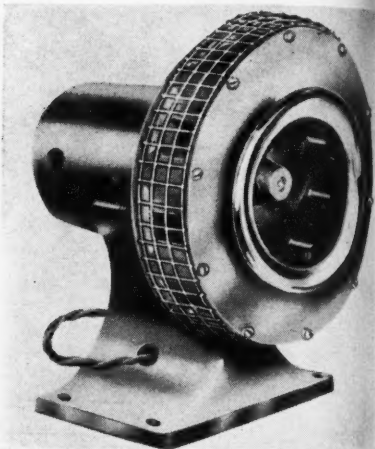
Write for Circular. Price
for complete tools: $\frac{1}{2}$ carat
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to 5 carats in stock. Immediate shipment.



F. F. GILMORE & CO.
112 DARTMOUTH ST. • BOSTON, MASS.

**Diamond
Importers and Toolmakers**

The Tornado Air-Raid Siren is equipped with a universal motor for use with either alternating or direct current, and can be operated from any ordinary light



Breuer "Tornado" Air-Raid Siren

circuit. In addition, the siren is provided with a base for either vertical or horizontal mounting.

"Clarify Cutting Oils and Coolants," a four-page bulletin issued by the Gale Oil Separator Co., Inc., Chrysler Bldg., New York, N. Y., treats in detail the operation, application, features, and selection, of the Gale Interceptor for cleaning cutting oils and coolants. Copy free upon request.

Lindberg Furnaces. A four-page folder illustrating and describing the Lindberg Super-Cyclone Furnace for annealing, normalizing, hardening, tempering, and nitriding, Lindberg Hydrazing Furnace for scale-free and decarb-free hardening, and Lindberg Cyclone Furnace for low cost accurate tempering is now being distributed by the Lindberg Engineering Co., 2458 W. Hubbard St., Chicago, Ill. Particular attention is given to a new heating principle incorporated in the Super-Cyclone Furnace which is said to provide the unit with 100 per cent forced convection heating. Copy of folder free upon request.

What is Your G.I.Q.?

(GAGE INTELLIGENCE QUOTIENT)

YOU can buy and use gages to better advantage if you can answer *all* these questions correctly. How about it?

Correct answers are printed below—upside down.



Standard "Not Go" Ring Gage



Standard "Go" Plug Gage

- 1 Is a gage a measuring device?
- 2 Define "Limits".
- 3 What is "Tolerance"?
- 4 What is "Allowance"?
- 5 There are two general classes of gages, Working and Inspection Gages. When is each class used?
- 6 Which holds the product to the closer limits?

ANSWERS

Write us for extra copies of this page, or for additional information.

GREENFIELD TAP AND DIE CORPORATION • GREENFIELD, MASS.

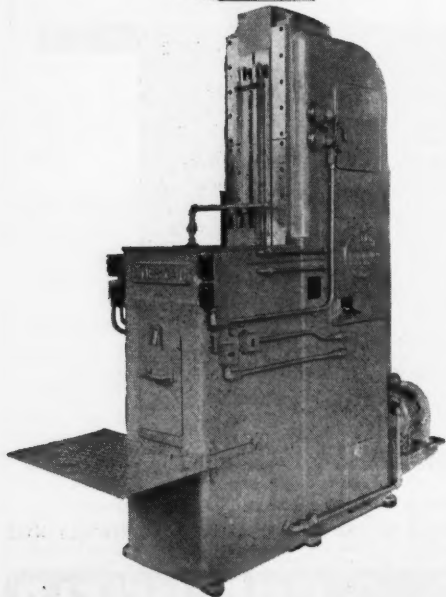
Detroit Plant 5850 Second Blvd. — Warehouses in New York, Chicago and Los Angeles
In Canada Greenfield Tap and Die Corp. of Canada, Ltd., Galt, Ont.

GREENFIELD

TAPS • DIES • GAGES • TWIST DRILLS • REAMERS • SCREW PLATES • PIPE TOOLS

This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

AMERICAN *Goes Over* *The* **TOP**



AMERICAN has gone "Over The Top" in supplying war manufacturers with suitable broaching equipment. We have supplied complete machines and tooling for rapid production of parts for planes, tanks, guns, ship shells, trucks and bombsights. We have drawn upon every ounce of ingenuity and years of past experience in order to produce machines and tools which will give the utmost in production and satisfactory performance.

Shown to the left is an AMERICAN SB-42-5 ton single ram surface broaching machine arranged for broaching split line on aircraft bearings. The machine is provided with a special work table and the part is clamped by hydraulic pressure. High production is obtained.

AMERICAN BROACH & MACHINE COMPANY

ANN ARBOR, MICHIGAN, U. S. A.

BROACHING MACHINES, PRESSES, BROACHING TOOLS, SPECIAL MACHINERY



The correct
oil film
to each
individual
bearing...
automatically

"CLEVELAND" Automatic Screw Machine with Bijur automatic
lubrication of spindle, turret and cross-slide bearings...

For speed AND ruggedness

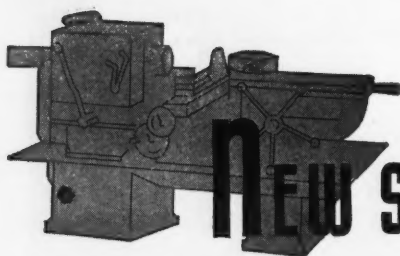
• Whatever the bearing surface, its location or lubrication need, BIJUR maintains the correct, metered oil film—automatically. Any number or combination of bearings—any type of machine! For high production maintained over long periods... Bijur built-in lubrication.

BIJUR LUBRICATING CORPORATION • LONG ISLAND CITY, N. Y.

1329

BIJUR

AUTOMATICALLY *Correct* LUBRICATION



NEW SHOP EQUIPMENT

Michigan No. 865-36A Gear Shaving Machine

Capable of handling gears up to 36 inches in diameter, a rotary gear shaving machine utilizing a crossed-axis principle of gear finishing is now being produced by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich. The machine, which is designated as the No. 865-36A, is similar in general design to the No. 865-48A shaver recently announced.

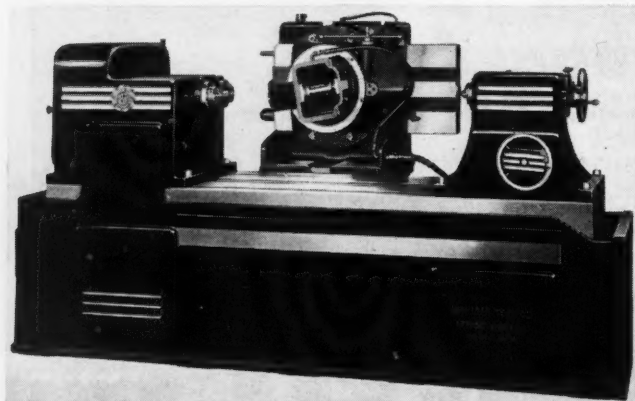
As on the larger machine, work on the No. 865-36A is driven with the cutter in engagement with the gear and "following" the gear. The machine is equipped with two driving spindles. The spindle nearer the cutter is designed to handle gears from 4 to 18 inches in diameter while the other spindle is suitable for gears from 18 to 36 inches in diameter. The center distance between the small work spindle and the cutter spindle ranges from 6½ to 16½ inches and between the large work spindle and the cutter spindle from 16 to 26 inches.

By means of the Michigan No. 865-36A Gear Shaver, three methods of finishing

gears are available. The first method is said to be particularly suited to the finishing of wide face gears, while the other two methods are said to be suitable for gears having a narrower face width than that of the cutter. Gears may also be crowned by means of the latter two methods by using crowned cutters. Various colored lights are used to indicate to the operator the various circuit conditions existing during the operation of the machine. Cone-Drive units are used for driving the various gear trains for infeed, cross-feed, and work rotation.

The Michigan No. 865-36A Gear Shaving Machine is designed for use with cutters from 8½ to 12 inches in diameter, with 6-inch maximum cutter face width. The recommended reciprocating speed for the cutter is about 4 inches travel per minute for 10-inch diameter work.

If the machine is to be operated on direct current, a floor mounted control panel is supplied with the unit. For a.c. operation, the machine is supplied with control panel mounted in the base. A 5 h.p. 1,200 r.p.m. motor is required for powering the machine.



Michigan No. 865-36A
Gear Shaving
Machine

Progressive Seam Welders

A complete line of seam welders in three capacity ranges and 126 models is announced by the Progressive Welder Co., 3017 E. Outer Drive, Detroit, Mich. In each of the light, medium, and heavy duty series, several standard throat depths are available. In addition, each type of welder is available with six dif-

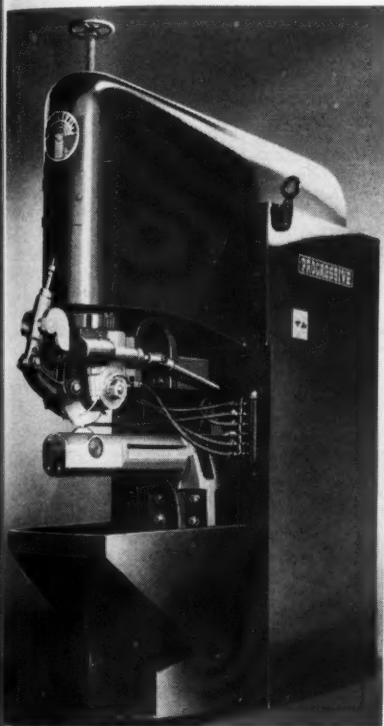


Fig. 1—Progressive Medium Duty Universal Type Seam Welder

ferent standard drives, three for circular and three for straight seam welding. The universal model (Fig. 1) which may be used for both straight and circular welding, is also available in three drive types and three capacity ranges.

Progressive Seam Welders are designed for either interrupted or continuous seam welding and are said to incorporate all the latest developments in seam welder design. In addition, the welders are attractively streamlined as well as ruggedly built.

Operating pressure in the seam weld-



Causes of Hack Saw Troubles

STRIPPED TEETH: Too coarse a tooth on thin-walled section; too fine a blade used on soft stock; blade started at wrong angle; too much pressure.

BROKEN BLADE: Insufficient tension, allowing blade to twist and buckle; new blade in old cut; too much tension on blade (if blade breaks at end holes only); too coarse a blade for hard stock; wrong angle of blade or too much pressure (if blade breaks when starting cut).

DULLED TEETH: Speed too high; feed too light; teeth pointing in wrong direction; frame not lifting properly on return stroke; improper blade selected.

CROOKED CUT: Blade too loose; frame out of alignment; feed too heavy; set worn off teeth.

Cure for Hack Saw troubles

Give your men this free 20-page booklet—packed with helpful tips and clear illustrations covering selection, use and care of hand and power blades, frames, and metal cutting band saws. Includes complete blade selection tables. Ideal for new, inexperienced men; helpful to old-timers as well. To speed work in your shop, write for free copies of "Metal Cutting" today.



2639

No. 865-30
Shaving
chine

ers is obtained through a double-acting adjustable-stroke air cylinder mounted directly on head support of machine. A double-action solenoid-operated valve is used to control air pressure on the pressure (top) side of the piston as well as for the introduction of air at line pressure on the lower side of the piston for rapid return of the head. A speed control valve is supplied in the air lines at both intake and exhaust sides of the cylinder to reduce shock. The solenoid valve is operated through a two-stage foot switch. The first stage brings the upper welding wheel down onto the work, while the second position starts the motor and sets welding wheels in motion simultaneously with closing of welding current circuit, the pressure switch being connected with the second stage of the foot switch.

Welding heads are designed with full adjustment for wear. All surfaces are lubricated to ensure long life and continuous perfect alignment. A special nonferrous alloy is used to line the cast bearing housing, which is internally water-cooled. The shaft which this bearing supports is also available water-cooled if desired.

The solid lower arms of the Progressive Seam Welders are specially de-

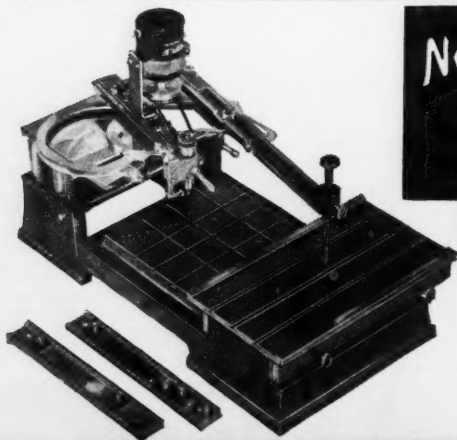
signed to suit individual jobs, and are externally water-cooled. Adjustment of stroke is obtained by means of a hand wheel controlling the position of a dummy piston in the machine head which also compensates for wheel wear and eliminates necessity for vertical adjustment of piston rod or head support.

The machines are designed for use on standard RWMA welding wheels, which can be readily adapted to individual applications and are externally water-cooled. Transformers — available to supply voltages of 220, 440, or 550 — all of the heavy duty type with shell type cores and pancake coils. Standard model seam welders are designed for 50-60 cycle supply, while special modifications make them adaptable for use with other frequencies.

Standard equipment of the Progressive Seam Welders includes a shroud, two-stage foot switch, air-line lubricator, air pressure regulator, air strainer, direct read pressure gage, and solenoid and dual speed control valve.

Porter-Cable 7-Inch Metal Shaper

The Porter-Cable Machine Co., 200 Wolf St., Syracuse, N. Y., is now introducing the 7-inch metal shaper shaper



New "VICTORY" MODEL ENGRAVER WITH LARGER CAPACITY

FEATURES...

- Smooth lines are cut on round and flat surfaces.
- Back lash eliminated.
- Micrometer control of cutting depth.
- Speedy set-ups.
- Ratios— $\frac{1}{2}$: 1 to 5 : 1 and intermediate settings.
- Specially constructed copy holder permits almost any type of set-up.

"Accurate Engraving With Unskilled Operators"

Engrave Iron, Soft Steel, Copper, Brass,
Aluminum, Plastics on the AUTO-ENGRAVER

Write for
Complete Details

MODEL A-1
Available with
Smaller Capacity

AUTO-ENGRAVER CO., 50 W. 46th St., New York, N. Y.

Which Blade is Yours?

AVOID COST OF REPLACEMENT
IN THESE TIMES

WHICH BLADE IS YOURS?

Here are two blades—one ready to deliver a maximum cut per stroke—the other ready for the scrap box.

Exclusive features on Racine High Speed Cutting Machines prevent early excessive wear on saw blades by oil cushioned control—eliminating costly vibration and chatter.

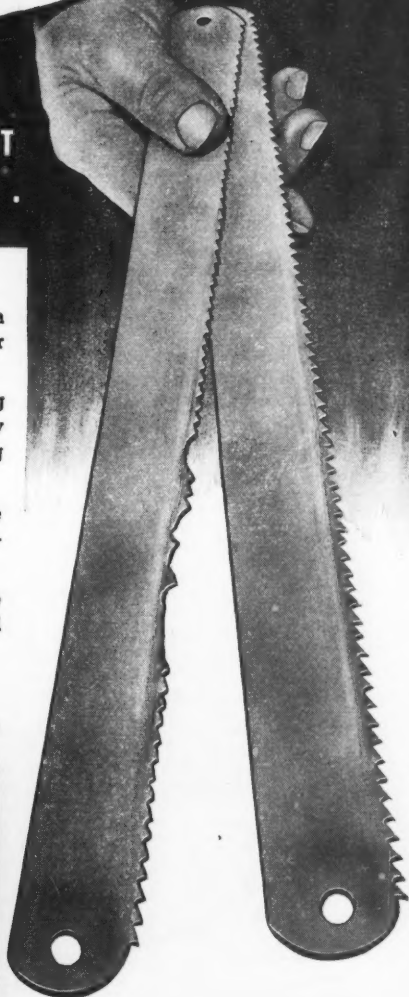
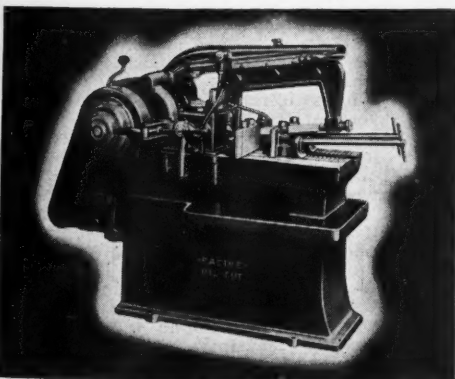
Each replacement—each inefficient cutting stroke is costly—and will be increasingly so as demands for war production mount.

Get the maximum out of every saw blade—use time proven Racine Metal Cutting Machines and solve your cutting problems.

RACINE TOOL AND MACHINE CO.

1770 State Street

Racine, Wisconsin



Write today for illustrated folders
covering our complete line.

RACINE

METAL CUTTING MACHINES

**Speed Production
Save Tool Room Time!**

Use **CLAYTON** Boring Bars and Holders

- ★ add extra production hours to every shift
- ★ make heavier cuts without chatter

Clayton Boring Bar Holders offer a new 2-way clamping arrangement which: 1) permits changing or adjustment of any size boring bar within the capacity of the holder, without disturbing alignment with lathe; 2) maintains identical setting for subsequent operation when holder is removed from the lathe; 3) provides rigidity for making heavier cuts without chatter; 4) no "fingering" adjustments or bushings required for any operation.

You can get quick deliveries of Clayton Boring Bars, and save needless tool room time. They offer these superior features: 1) permanently calibrated quarter inch graduations which eliminate necessity for file or chalk marks; 2) minimum surface tension eliminates chatter and allows heavier cuts; 3) bit holes accurately broached to eliminate vibration and to insure rigidity of bit.

Speed your war production by using Clayton Boring Bar Holders... relieve your tool room of costly, time consuming bar-making work by using Clayton Boring Bars.



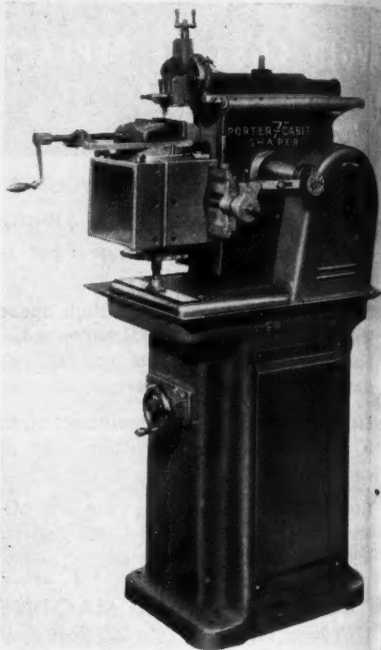
Write for literature or
phone your supply house

CLAYTON
MANUFACTURING COMPANY
Alhambra • California

in the accompanying illustration. The machine is a self-contained motor-driven unit with motor and speed change control mounted in pedestal.

The ram of the machine is provided with a travel of 7½ inches and is designed to operate at any speed from 64 to 175 strokes per minute. The ram is 16½ inches long x 5 inches wide.

The 4-inch diameter toolhead of the machine can be swiveled 360 deg. and



Porter-Cable 7-Inch Metal Shaper

has a travel of 2½ inches. The table, which is 8 x 8 x 7½ inches in size, has a longitudinal travel of 10½ inches and vertical travel of 5½ inches. The table is adjusted by means of a conveniently located handwheel. Most adjustments of the machine are made without wrenches, others with a single wrench.

For smooth operation, the Porter-Cable Shaper is provided with sprocket and chain drive and extra heavy crank-pin plate to minimize chatter. Six cross feeds ranging from 0.002 to 0.012 inch can be obtained. Additional features of the machine include tapered pins for quickly locating head and vise, and micro-set ram for quick set up.

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Let us help you *speed* war production

ALTHOUGH our stocks of steel are not what we wish they were, what we have can be yours in a hurry—subject, of course, to priority restrictions. If we don't have what you need, we will do everything possible to help you find a source of supply. Our first job, like yours, is to do everything we can to speed production that will help win the war.

"Scully Service" is on the job—in all of our eight conveniently located warehouses—day and night. Try Scully—see our phone numbers at left. Cut out the number of the warehouse nearest you and paste it in a handy spot.

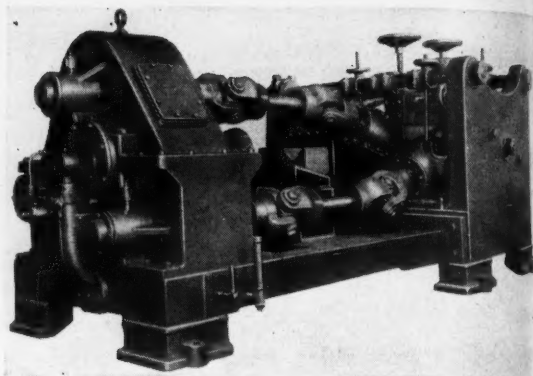


SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel and Steel Products

UNITED STATES STEEL

Equipped with standard $\frac{1}{2}$ h.p. motor, the Porter-Cable 7-Inch Metal Shaper is approximately 51 inches high overall and requires a floor space of 14 x 19 inches. The weight of the machine is approximately 485 pounds.



Medart Improved Standard Bar and Tube Straightening, Sizing, and Polishing Machine

The Medart Co., Pottomac and De Kalb Sts., St. Louis, Mo., announces an improved line of two roll standard bar and tube straightening, sizing, and polishing machines. The line now includes eight sizes of machines with bar and tube capacity from $\frac{1}{4}$ to 9-in. diameters.

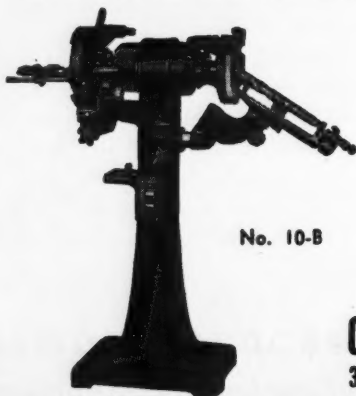
According to the manufacturer, improvements in all models have greatly increased the speed with which work can be fabricated and the facility of op-

Medart No. 3 Standard Bar and Tube Straightening, Sizing, and Polishing Machine

eration. The wider angularity of roll adjustment now possible is said to provide a greater variation in working operations, adjustments ranging from those for high speed straightening to more exacting operations of sizing and polishing all types and conditions of bars.

Universal joints are now Timken bearing equipped, thus assuring unusually

GRAND RAPIDS Combination Tap and Drill Grinder MOTOR DRIVEN



No. 10-B

SHARPENS TAPS
2-3-4 Flute, Right or Left Hand.

SHARPENS DRILLS
2 or 3 Flute, Straight or Taper Shank.

Grinds DRILLS $\frac{1}{8}$ " to $1\frac{1}{2}$ " and TAPS from No. 6 to $1\frac{1}{2}$ ".

Other Combinations also available.

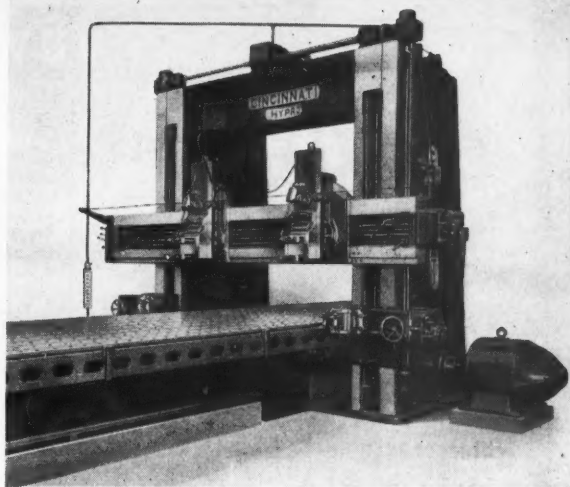
Write for Catalog.

GALLMEYER & LIVINGSTON CO.
336 STRAIGHT AVE., S. W. • GRAND RAPIDS, MICH.

We Are Preparing for Peace

We have been unable to manufacture Cincinnati Hypro Planers, Vertical Boring Mills and Planer Type Millers in quantities large enough to serve all our customers who desire them.

Priorities are dictating at present the distribution of our machines. Meanwhile, the 6000 machine tools the Cincinnati Planer Co. has manufactured since 1899 are continuing to tell the story of high production. Accuracy and continuous operation built into Cincinnati Hypro machine tools are a by-word of modern industry.



120" x 96" x 44" Hypro Planer

When peace comes we hope to serve all of you again. We will bring you many new improvements in planers, planer type millers and vertical boring mills, developed during our 43 years experience and further improved while currently serving our country.

Meanwhile, you can keep posted on latest developments by writing for a copy of our general bulletin No. 152, or a bulletin covering the special type of machine you can use. We will also send you a list of our hundreds of satisfied users if you will mention the type of machine you are interested in.

Then you can visit a plant near you and see a Cincinnati Hypro planer, planer type miller or boring mill in action. We know that what you see will interest you and solve many of your production problems at present and in the future days of peace.

The CINCINNATI PLANER Co.

CINCINNATI

OHIO, U. S. A.

PLANERS • PLANER MILLERS • VERTICAL BORING MILLS

FORTIFY YOUR BELTS

for the Duration
(AND LONG AFTER)

Since 1896 Cling-Surface Belt Treatment has lengthened the life of millions of belts—by fortifying them against the attacks of oils, moisture, dust, dry-rot. Easily applied, Cling-Surface gives a non-slip grip that permits slack-belt operation. Power increase up to 40%, with saving of belts, bearings and shaftings. Used by the U. S. Army and Navy. Ask about our practical trial offer.

Help conserve precious

RUBBER & LEATHER



Cling-Surface Company

1034 Niagara St.
Buffalo, N. Y.



with

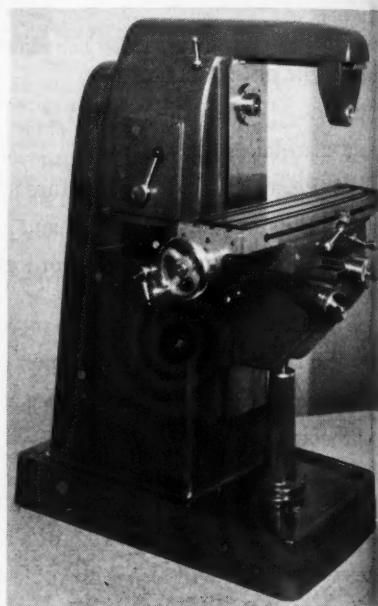
CLING-SURFACE

Belt Treatment

smooth operation. Rolls are of high grade Smauroc forged tool steel, properly heat treated, tempered, and highly polished. The concave roll is of a well-known patented Medart design. The outstanding features of continuous end-to-end feeding and instant reversal of workpiece direction have been retained in all models.

Douglas Plain Milling Machine

To meet the demand for a small sturdy milling machine for accurate work on a production basis, the Douglas Machinery Co., Inc., 150 Broadway, New



Douglas Plain Milling Machine

York, N. Y., has introduced the plain milling machine illustrated herewith. The machine is driven by a constant speed standard electric motor built into the base. Power is transmitted through a V-belt, with tension controlled by adjustable motor base. The final drive to the spindle is effected through a gear reduction, which ensures full horsepower output at all spindle speeds.

The spindle and shafts in gear box are mounted on Timken bearings, and all gears are totally enclosed and oper-

I'm on my way

SOONER—

because



TRU-LINE TOOLS dress centerless grinding wheels with amazing speed and accuracy!

Shot, shell and projectile forms are rolling off production lines much faster these days because Tru-Line Tools eliminate all the defects and delays incidental to using single diamond wheel dressing tools.

Once positioned to the wheel the Tru-Line Tool needs no resetting, no turning and no changing until the diamonds are completely used.

The desired wheel form is easily obtained with absolute accuracy and, because every dressing is right the first time, there is great saving in down-time. The wheel

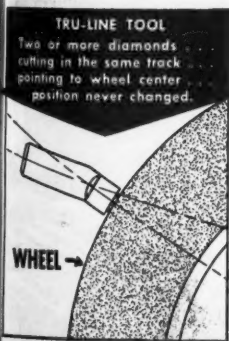
is cleaner and freer-cutting and produces many more uniform pieces between grindings.

Savings in wheel cost may be 50% because fewer dressings are needed and fewer passes per dressing.

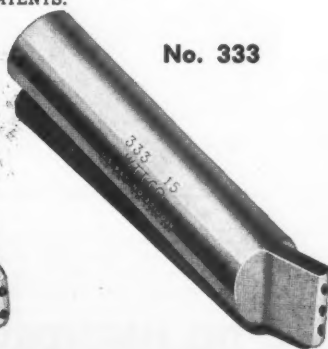
Tru-Line Tools are available for fast production of all shot, shell, and projectile forms that are centerless ground.

Send for illustrated folder describing the revolutionary, patented Tru-Line Principle, and engineering data sheets.

COVERED BY U. S. AND FOREIGN PATENTS.



No. 2-W



No. 333

WHEEL TRUEING TOOL COMPANY

3215 W. Davison

DETROIT

Established 1910

ate in oil bath. The spindle is made of hardened and ground alloy steel and is provided with a No. 40 Milling Machine Standard taper. Spindle rotation is reversible by electrical control.

The column of the machine is an amply ribbed casting of sturdy design, thus ensuring firm support to spindle and driving shafts. The large rigid rectangular box-type overarm provides proper support and alignment of arbor and cutter at all times.

The lower part of the column forms a coolant tank. An electrical pump supplied as an extra conveys the coolant to the work, from where it flows back to the tank through a close-meshed filter. A large opening covered by this filter provides ready access to the tank for cleaning purposes.

The knee of the machine is box shaped and is amply ribbed. Wide and long guide ways provide accurate vertical movement of the knee. The saddle is sufficiently large to ensure rigid support of the table in all positions. The cross slide is supported by wide bearing surfaces.

The table, which is equipped with longitudinal power feed, hand trip and automatic stop, is operated by engaging a worm gear on the lead screw driven

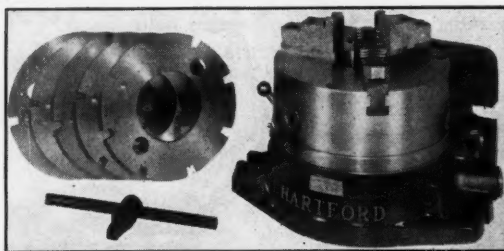
by a simple six-speed gear mechanism through a telescopic drive. Vertical and cross movements of the table are hand operated. Large graduated friction discs are provided for both vertical and cross feed as well as for longitudinal traverse of the table. All lead screws are mounted on anti-friction bearings, thus ensuring sensitive accurate control of movements.

Changing of feeds is effected by hand lever, which is conveniently located on the left-hand side of the machine. A wide range of spindle speeds is provided, allowing for the efficient machining of cast iron, steel, brass, and light aluminum.

Specifications of the Douglas Plan Milling Machine are as follows: working surface of table, 32 x 8 inches; maximum distance table to center of spindle, 15½ inches; automatic or manual longitudinal traverse of table, 17½ inches; cross manual traverse of table, 5 inches; vertical manual movement of table, 1½ inches; distance from center of arbor to overarm, 4½ inches; spindle taper, No. 40 Milling Machine Standard; number of spindle speeds, 8; range of spindle speeds, 75 to 1,200 r.p.m.; hole through spindle, ½ inch; number of table feeds, 6; feeds in inches per rev-

For SPEEDING UP Indexing and Chucking

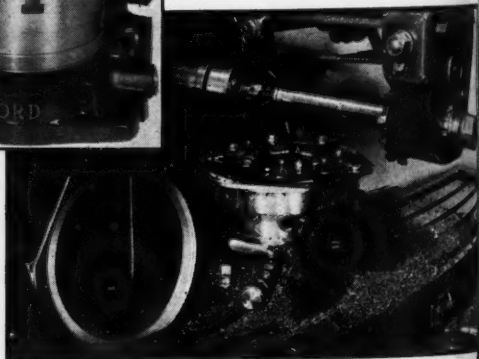
The HARTFORD "Super-Spacer" is more rigid and more rapid in operation than the conventional dividing head. It can easily be set up for one piece or thousands. Interchangeable mask plates make errors impossible on divisions of 2, 3, 4, 6, 8, 12 and 24.



"Super-Spacer" with faceplate for straddle milling the hexagonal side of aeronautical engine part. Locating plug to fit bore of work is strapped to faceplate.

Write for complete specifications and illustrations of milling, drilling, grinding, jig boring, planning, slotting and boring operations.

**THE HARTFORD
SPECIAL MACHINERY CO.**
HARTFORD • CONNECTICUT



Let the OPERATORS Tell You About the NEW SPEED, EASE and SAFETY...

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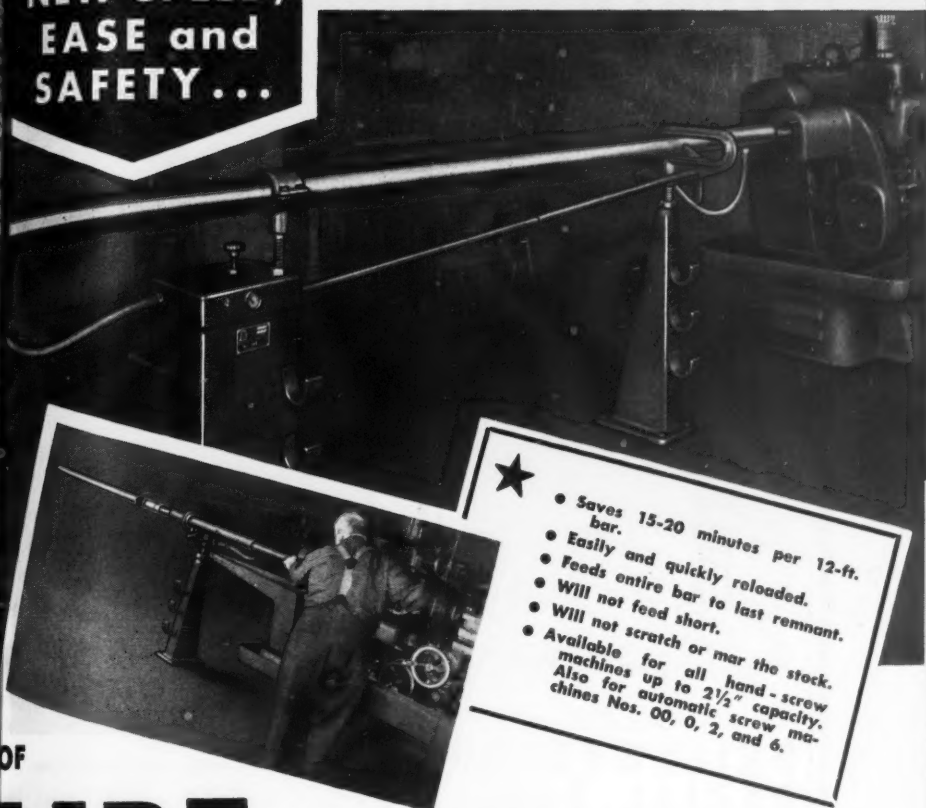
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- Saves 15-20 minutes per 12-ft. bar.
- Easily and quickly reloaded.
- Feeds entire bar to last remnant.
- Will not feed short.
- Will not scratch or mar the stock.
- Available for all hand-screw machines up to 2 1/2" capacity. Also for automatic screw machines Nos. 00, 0, 2, and 6.

LIPE PNEUMATIC BAR FEED . . .



The Lipe Pneumatic Bar

Feed consists of an air cylinder long enough to take a full-length stock bar. As the collet is opened, low-pressure air acting against the piston with a ball-bearing cup-center, advances the bar to the fixed stop. The action is fast, accurate.

Yes sir, operators are highly enthusiastic about this Lipe Pneumatic Bar Feed. They say it gets more out of the machine and takes less out of the man. "I can work hours longer and come back fresh and fit the next day," is a common saying.

That's because the Lipe Pneumatic Bar Feed eliminates all the pulling and tugging on feed levers, for one thing. It's safer too. There are no exposed bars, no whipping ends, nothing to catch clothing. And there's no chance of accidental starts.

You'll find it will give you a big improvement in your screw machine output . . . and at a relatively low cost. A nearby Lipe technical representative will call on request.

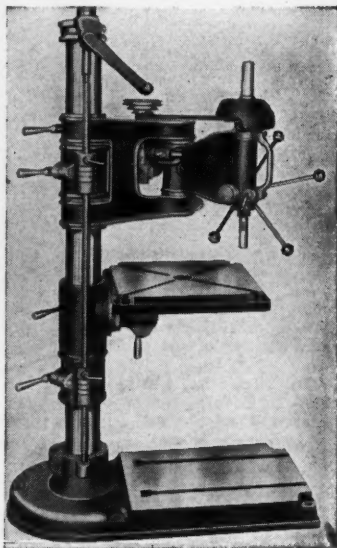
LIPE-ROLLWAY CORPORATION

Syracuse, N. Y., U. S. A.

START NOW!

Increase Production

End Worker Fatigue By Making
Your Drilling Job Easier.



Use the DRILLMASTER RADIAL DRILL

This floor type, heavy duty, precision-made, well balanced Radial is economical in initial cost and operating cost. It offers many features that merit your careful consideration. Drills to the center of a 36" circle . . . No. 2 Morse taper . . . Heavy duty 1/2 h.p. ball bearing motor . . . Full floating, ball bearing spindle assures free and sensitive operation at all speeds.

Send **TODAY** for detailed bulletin.

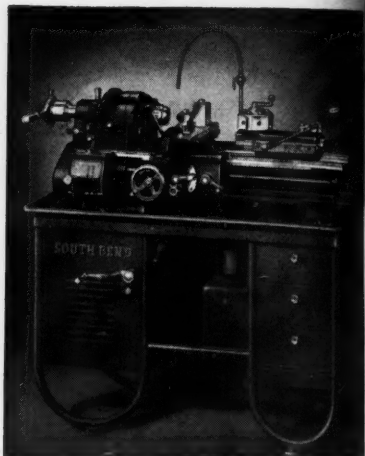
**Wm. C. Johnson & Sons
Machinery Company**

St. Louis • Missouri

lution of cutter spindle, 0.0024, 0.0055, 0.0071, 0.0107, and 0.0160; motor required, 1 1/2 h.p., 60 cycle, 3 phase, 1,725 r.p.m.; net weight of machine, approximately 1,900 lb.; shipping weight (crated), approximately 2,100 pounds.

South Bend Series 100 Turret Lathe

Designated as the Series 100, a standard bench model turret lathe for rapid production to close tolerances on chuck or bar work has been announced by



South Bend Series 100 Turret Lathe

the South Bend Lathe Works, Dept. 42, South Bend, Ind. The lathe, which is said to be well adapted to second operation work, has a 10-inch swing over bed and saddle wings, 1 1/2-inch hole through headstock spindle, and 1-inch collet capacity.

The hand lever operated bed turret indexes automatically and has an adjustable stop for each of the six turret faces. The machine is equipped with both a compound rest cross slide and a hand lever cross slide which are interchangeable. The latter is furnished with front and rear tool blocks, which provide three tool positions.

A quick-change gearbox provides 48 longitudinal power feeds for the universal carriage, 48 power cross feeds for the compound rest cross slide, and 48 thread-cutting feeds, 4 to 224 per inch. Underneath motor drive and back gear

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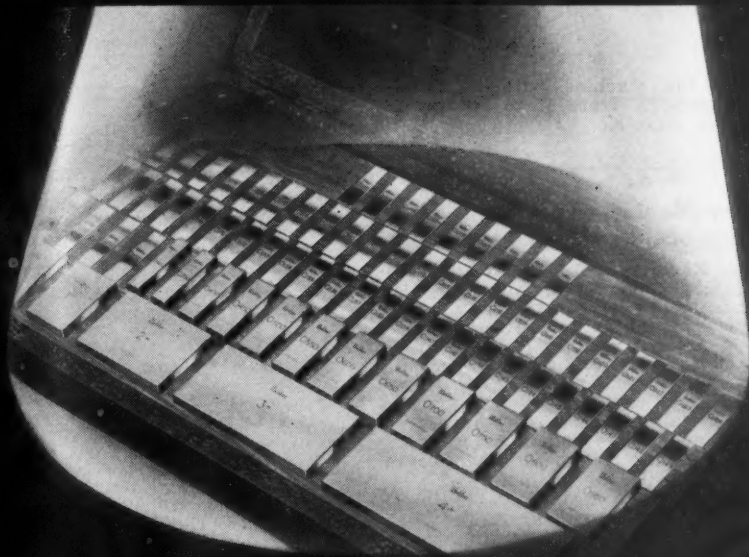
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HOW MUCH CAN YOU IMPROVE ACCURACY OF .000004"? (*4 millionths of an inch*)

Every gage block in the box pictured above is accurate to .000004" or less.

But that's not good enough!

On so seemingly hopeless a task as improving accuracy of .000004" WEBBER technicians are constantly at work. Their goal is not to meet existing standards of accuracy but to set new ones.

Not long ago "hairline" denoted extreme

accuracy — today it's thousandths and ten thousandths of an inch — and tomorrow, thanks to the efforts of such men as are found at WEBBER Gage Co., it will be far less.

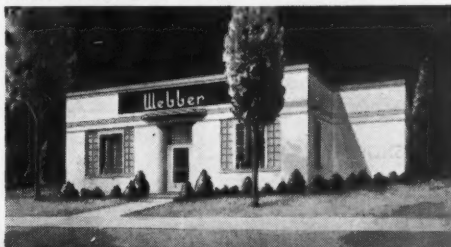
WEBBER'S goal of constant improvement is your guarantee that the WEBBER Gage Blocks you buy are the best obtainable — that you can safely rely on them as the foundation for all your precision measuring.

Webber

GAGE COMPANY

12901 TRISKETT RD., CLEVELAND, OHIO

To meet war time demands the entire capacity of the new WEBBER "Home of Precision" is being devoted to manufacture of GRADE A Gage Blocks.



Prompt Delivery to firms furnishing necessary priority certificates. Prices for Set No. 81A (pictured above) \$350.00. Set No. 40A, \$185.00.

provide the machine with 12 spindle speeds ranging from 97 to 700 revolutions per minute.

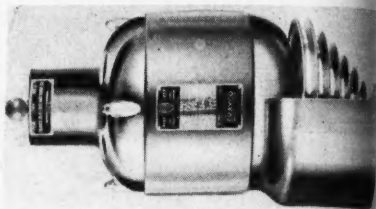
Fray Machine Tool Company Establishes New Company

Fray Machine Tool Co., 503 W. Windsor Rd., Glendale, Cal., announces the establishment of a new company for the exclusive manufacture of a complete line of motors ranging from $\frac{1}{8}$ to $7\frac{1}{2}$ h.p. This company, to be known as the Frayco Electric Motors Company, will specialize in the production of motors with special end bells for manufacturers of machine tools and other equipment in which the motor is to be incorporated with the product.

Frayco Motors are available in all standard NEMA dimensions and shaft sizes. Standard frame mountings are of Mechanite, normalized for permanent alignment. In addition to standard plain and flange type mountings, Frayco Motors are available in special designs to meet the individual requirements of machine designers.

Frayco Motors are designed for long service under severe operating condi-

tions. Rotor windings are cast integral with rotor laminations. In the laminations, special electrical steel increases efficiency and overload protection. Also



Frayco Electric Motor

laminations are welded together to increase rigidity and resistance to vibration. Oversize rotor shafts are further assurance of rigidity.

Rotors are mounted in lifetime lubricated ball bearings and are statically and dynamically balanced. All parts are machined to close tolerances for interchangeability.

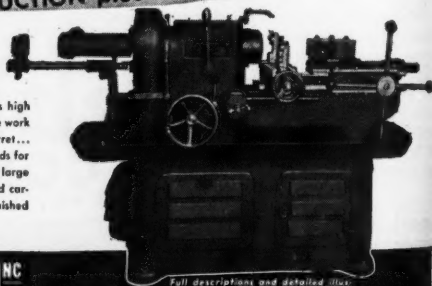
Frayco motors are double fan cooled and all precautions are taken to insure efficient operating temperatures for maximum torque.

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret—Infinite Spindle Speeds

CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Features HIGH SPEED PRODUCTION plus OPERATING ECONOMY

The MOREY 2G Timken Bearing Turret Lathe insures today's high speed production with a minimum of operating expense. More work at less cost with these money saving features: Self-Locking Turret... Vibrationless precision with an infinite variety of spindle speeds for every job... Back Gears instantly thrown in through extra large Twin Disc Clutch... takes full advantage of high speed and carbide tools. Modern design for modern production. Can be furnished with tooling.



MOREY MACHINERY CO., INC.

410 BROOME STREET • NEW YORK, N. Y.

Full descriptions and detailed illustrations are shown in Circular 629. Ask for it TODAY!

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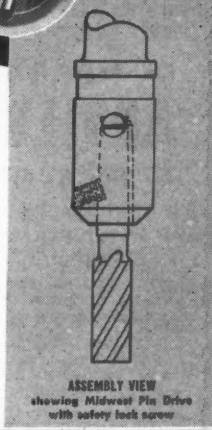


THESE HIGH PRODUCTION TOOLS OFFER THE POSSIBILITY OF INCREASING YOUR PRODUCTION

Midwest End Mills are made with a high helix angle (fast spiral) to provide maximum speed in action, and with plenty of chip room to prevent clogging of chips in the flutes.

The Midwest Taper and Pin Drive tool holder has a round pin partially imbedded in the wall. A corresponding keyway in the tapered shank of the end mill fits this pin. As a result full driving energy is exerted along the entire length of the end mill shank. A safety lock screw holds the shank firmly in place. The drive is positive, rigid and always perfectly aligned.

These features in Midwest Pin Drive End Mills permit higher speeds and feeds; they result in greater production, more accurate work and exceptionally high finishes in milling operations.

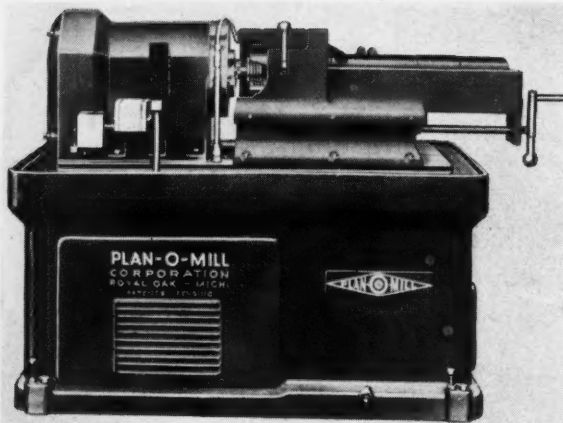


MIDWEST

Precision METAL CUTTING TOOLS

- END MILLS • SLEEVES
- COUNTERBORES •
- SPECIAL TOOLS • DRILLS
- REAMERS • FORM TOOLS
- CARBIDE TIPPED TOOLS
- ADJUSTABLE HOLDERS

MIDWEST TOOL & MFG. CO. • 2366 W. JEFFERSON AVE. • DETROIT, MICHIGAN



Plan - O - Mill Model 3 with Thy-mo-trol Feed Control

Plan-O-Mill Model 3 with Thy-mo-trol Feed Control

The Plan-O-Mill Corp., 1790 Broadway, New York, N. Y., formerly the Gordon-R Co., Royal Oak, Mich., announces a further improvement in its standard

planetary milling machine—the Plan-O-Mill. This improvement involves the use of a General Electric Thy-mo-trol feed control built into the machine, which is designated as the Plan-O-Mill Model 3.

Converting alternating current into direct current, the Thy-mo-trol provides an infinite and stepless range of feed, both into and around the work, by regulating the flow of current to the feed motor. By means of the Thy-mo-trol, cum-

bersome or irregularly shaped parts can be quickly and accurately milled on the Plan-O-Mill, since all motion is in the milling head—the part remains still. On even the largest jobs, the time required to reverse the cutter and return it to center is said to be reduced 15 seconds or less.

COMPARATOR and SNAP GAGE ANVILS RESURFACED

by the ACME FLAT LAPPING PROCESS

* Gage blocks and anvils, (serrated or plain) need frequent check-ups to detect the surface deviations caused by local wear. To insure that your comparators, gages and other measuring instruments will give accurate readings, send your comparator and snap gage tables, anvils, or other flat contacts of any type or style, to Acme for refinishing.

Because Acme is equipped to measure in terms of micro-inches, and experienced in extreme precision manufacture, surfaces can be finished to as near absolute flatness as your requirements dictate.

Be sure your measuring instrument anvils are accurate. Send them with any other flat parts to Acme for resurfacing today.

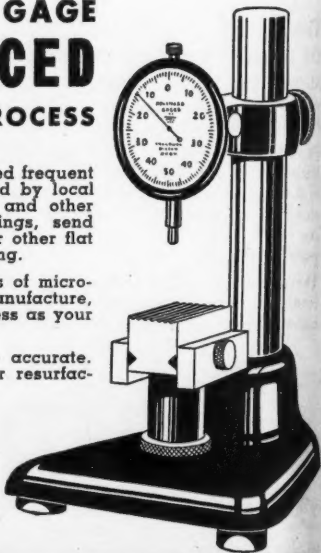


ACME INDUSTRIAL CO.

Makers of Hardened and Ground
Precision Parts

212 N. Laflin St.
MONroe 4122

Chicago, Ill.

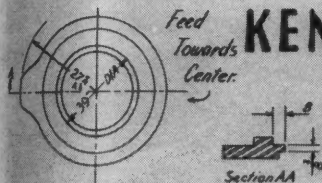


On these 3 Operations



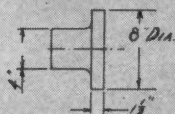
STYLE 11

1. INTERRUPTED CUT ON BOILER PLATE RINGS FOR GUN MOUNTS



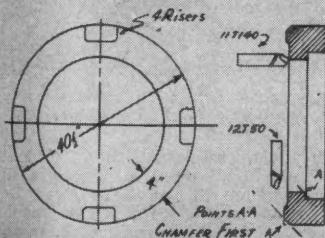
Material: Flame Cut Boiler Plate
Speed: 14 RPM; 190 ft./min.
Roughing: Feed $1/32"$ —Depth $3/16"$
Finishing: Same Speed and Feed

2. ROUGHING AND FINISHING 8" DIAMETER GEAR BLANKS



Material: Rough Forgings SAE 1045
Speed: 165 RPM; 340 ft./min.
Turning O. D.: Feed $.010"$ —Depth $1/8"$
Facing: Feed $.003"$ —Depth $1/8"$

3. FACING AND BORING ALUMINUM RING CASTING



Material: Aluminum Bronze Casting
Speed: 19 RPM; 200 ft./min.
Facing: Depth $5/16"$
Boring: Feed $.011"$ —Depth $3/8"$

KENNAMETAL* Performed Successfully

AFTER ORDINARY CARBIDE TOOLS HAD FAILED

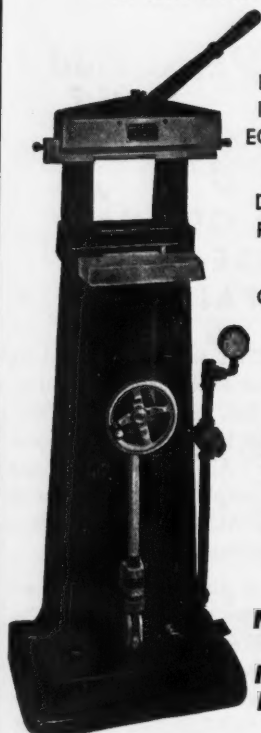
KENNAMETAL tools were used as standard on each of the jobs illustrated at left, after other carbide tools tested had failed to perform efficiently. All three operations were accomplished easily with KENNAMETAL, at the economical speeds and feeds mentioned.

Because of similar superior performances on many types of jobs, KENNAMETAL is decreasing machining time and saving money for manufacturers throughout the country. The KENNAMETAL representative in your district will gladly survey your tool requirements and demonstrate how KENNAMETAL can save you time and money. Write us.

*Invented and Manufactured in U.S.A.



YOUR PRODUCTS
ALWAYS
IDENTIFIED
IF PERMANENTLY
MARKED
IN THIS MACHINE



MARKING
BY ROLLING
IS FAST AND
ECONOMICAL.

PRESERVES
DIE LIFE AND
PIECE PARTS.

REQUIRES
ONLY FRACTION
OF
APPLIED
PRESSURE
AS COM-
PARED TO
STAMPING.

—
QUICK
SET-UPS

**MODEL 25
HI-DUTY
MARKING
MACHINE**

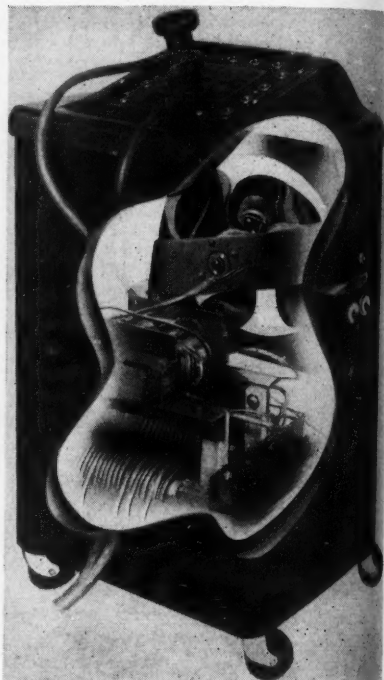
This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
CHICAGO, ILLINOIS

The Plan-O-Mill Model 3 with Thymo-trol is designed for internal and external, right or left-hand threading and form milling where rapid production, precision, and high finish are required.

Ergolyte 250 F Arc Welder

Designed for use in performing continuous heavy duty mass production welding operations, an air-cooled arc



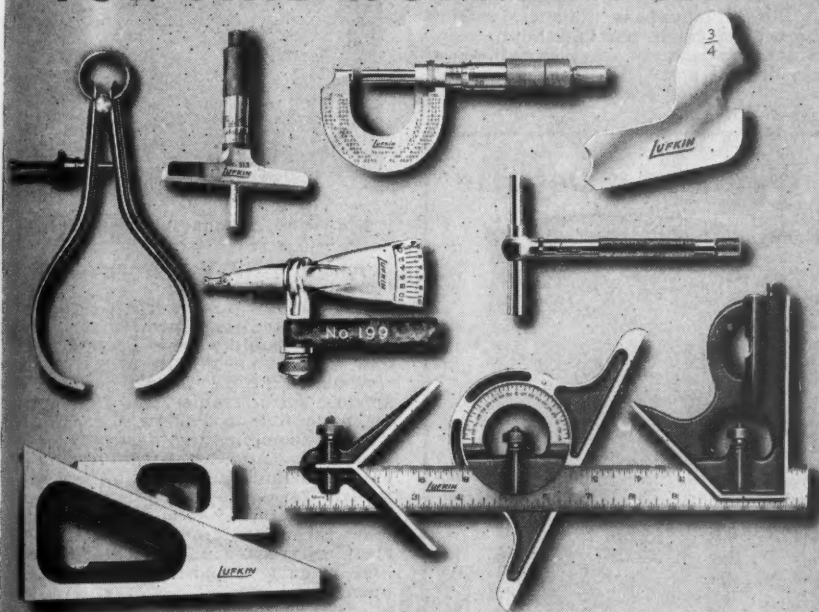
Ergolyte 250 F Arc Welder

welder designated as the 250 F has been developed by the Ergolyte Mfg. Co., Lawrence St. at Erie Ave., Dept. P-14, Philadelphia, Pa. The machine contains a built-in cooling system which is said to reduce thermal stress to a minimum, thus prolonging the life of the welder.

Capable of handling electrodes from $\frac{1}{16}$ to $\frac{1}{8}$ inch, the Ergolyte 250 F Arc Welder is provided with 24 heat steps, an input voltage of 230 volts, and a cur-

LUFKIN TOOLS

FOR FINE WORKMANSHIP



There's something about Lufkin Precision Tools that appeals to mechanics who take real pride in their work. Perhaps it has its roots in the downright good workmanship that's put into them in the first place. At any rate—it isn't hard to find—and your dealer will be glad to show you.

BUY THROUGH YOUR DISTRIBUTOR

NEW YORK
106 Lafayette St.

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

Canadian Factory
WINDSOR, ONT.

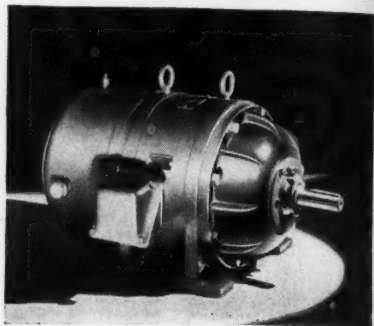
TAPES — RULES — PRECISION TOOLS

rent range of from 15 to 250 amperes. The machine has a 60 cycle frequency and is designed for operation on a single phase or one phase of a two or three phase current. Welders with special frequencies may be built to order.

G-E Motors for Magnesium Dust Locations

A line of polyphase induction motors designed for use in plants handling magnesium, particularly where fine magnesium dust is encountered, has been announced by the General Electric Co.,

Schenectady, N. Y. Specified as suitable for Class II, Group E locations, the motors are available in sizes from 1 to



G-E Motor for Magnesium Dust Locations

20 h.p. with N.E.M.A. frames 203 to 336 inclusive.

The motors are totally enclosed, a non-ventilated construction being employed by motors with smaller ratings and a fan-cooled construction by motors above 2 h.p.. Simple cast iron end shields, stator frames, and fan housings make possible a dust-tight construction without complicating assembly or disassembly. Additional features of the motors include non-sparking bronze external fans, relatively straight and smooth external ventilating passages (for fan-cooled motors) to facilitate cleaning, permanently sealed-in leads, and rotating labyrinth seals at shaft openings.

Amatco Five Station Oscillating Tool Block Lathe Turret

Shown here is a five station oscillating tool block lathe turret which is now being marketed by the Automatic Machine

TURRET TOOL POST

Hardened throughout, self-compensating for wear, precision built. For top production on small South Bend, Sheldon, Clausing, Atlas, Logan and similar bench lathes and small screw machines.



F & M SALES COMPANY, HOLLYWOOD, CALIF.
Manufacturers and Selling Agents

Welders for Defense



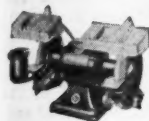
Any two Knock-Out welders can easily be connected in series to combine the amperage of both machines for occasional jobs requiring large capacity. Separated, they can be used on different jobs within their capacity.

Write or Wire for Bulletin W42-8M

K. O. Lee Company
Aberdeen, South Dakota

Here's why shops *busy on the armament program* insist on *Delta Grinders*

1. Special motors designed and balanced exclusively for Delta grinders.
2. Grinder wheels dynamically balanced to 1/100 inch-ounce.
3. Double sealed-for-life ball bearings—lubricated for life—sealed against grit.
4. Twin-lite Safety Shield—eliminates need for goggles — provides illumination on both sides and face of wheels.
5. Fully machined, easily adjustable tool rest—rigidly mounted adequate guards.



Also Bench Models

Built in both single phase and three phase models, bench and pedestal types, there is a Delta grinder to fit every shop. The motor-driven bench grinder also incorporates all of the latest Delta design and construction features . . . absolute freedom from vibration (due to especially balanced Aluminum Oxide wheels).

Other Delta Low-Cost Machines



A complete line of single and multiple spindle 14" and 17" drill presses in slow and high speed models.



Metal Cutting Band Saw cuts almost anything in metals and plastics.



Cut-Off Machine cuts speedily and to exact lengths a wide variety of materials.

Send for Catalog

Send coupon below for Delta Catalog giving full details and specifications on the complete line of Delta grinders.

DELTA MILWAUKEE

DELTA
MILWAUKEE
PRODUCTION
TOOLS

The Delta Manufacturing Company
601-H E. Vienna Ave., Milwaukee, Wis.

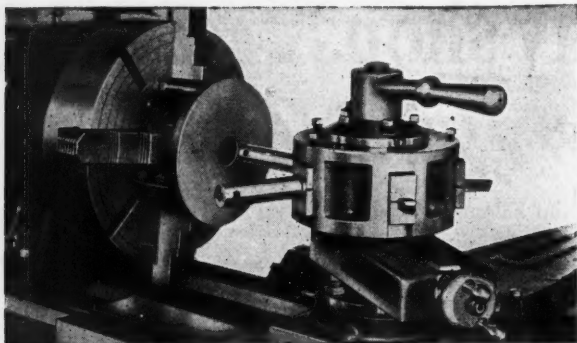
Please send me your special Grinder Bulletin giving full details and specifications on the complete line of Delta Grinders. ☐ Also send me your latest Delta catalog of industrial power tools.

Name _____

Address _____



No. 1246



Amatco Five Station Oscillating Tool Block Lathe Turret

& Tool Co., 132 Charles St., Auburndale, Mass. Available in three sizes for use on all lathes with swing from 9 to 30 inches, the turret is equipped with an index plate having 10 stops, thus allowing for 10 different tool settings. The index plate is extra large in diameter to provide rigid support to boring bars and tool bits.

The center post of the unit is of heavy construction and is equipped with lock nut and flatted to allow for making solid connection to top of compound slide. The slot anchor for center post is properly

top of turret body.

The Amatco Lathe Turret is supplied complete with five sets of tool blocks, all of which are interchangeable in any of the five stations in the turret head. The tool blocks can be furnished to accommodate various size tool bits and boring bars. The bottom half of all tool blocks oscillates about a tool steel hardened pin, which is threaded into one half of the turret body and slotted on the other end, thus allowing for easy removal of the pin as well as tool blocks. Hardened

hardened and is of sufficient length to ensure ample support of post.

The turret head body is made of semi-steel, accurately hardened and of ample strength to ensure long life and maximum rigidity. The index pin is made of hardened steel and can be easily operated by lifting knurled knob located on

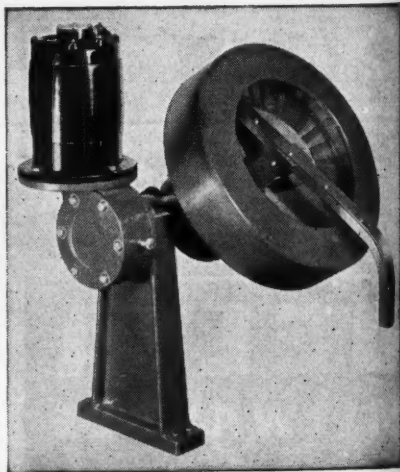
MOTORIZED HOPPER UNITS

ADAPTABLE TO ANY MACHINE.

FEED BULLET CORES,
SCREWS, PINS, WASHERS,
BEARING ROLLERS, NUTS,
RIVETS, SPECIAL PARTS.

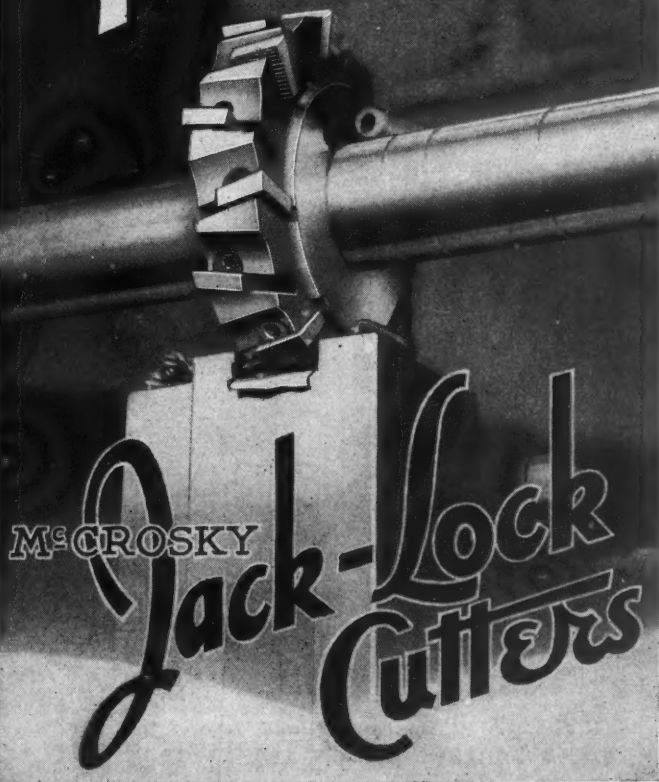
Send Samples for
Information and Prices.

Detroit Power Screwdriver Co.
2807 W. FORT ST., DETROIT, MICH.



COST
CUTTING
TOOLS

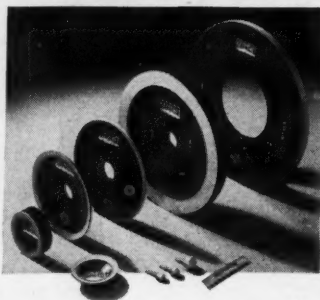
Time & Cutter



McCROSKY TOOL CORP.
MEADVILLE, PA. • ASK FOR BULLETIN 15-M.

DIAMOND WHEELS
RESINOID
BONDED

SECOMET



SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster, and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

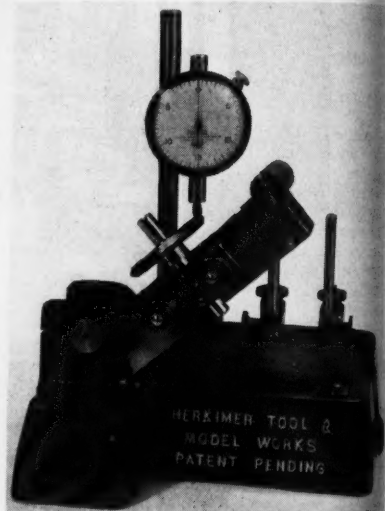
Prompt deliveries

**157 Chambers St.
New York
N. Y.**
J.K. SMIT & SONS, Inc.

screws applied to top half of tool blocks provide means for rigidly clamping bearing bars or tool bits. These screws can also be used to adjust tool bits after grinding and allow for ease of recentering tools.

Herkimer Sine Bar Gage

A sine bar gage designed to reduce gaging of bevel gears to its simplest form is now being offered by the Herkimer Tool & Model Works, 113 George



Herkimer Sine Bar Gage for Use on Conventional Surface Plate

St., Herkimer, N. Y. The gage is provided with an aligning seat which is said to receive alternatively and align either a special apex-defining setting-up bar or a mandrel on which the gear blank to be measured may be mounted. The setting-up bar is used in conjunction with gage blocks to define a plane passing through the apex of the gear cone of a bevel gear as related to the thrust face of the gear hub.

The setup of the gage for measuring a gear can be made from dimensions usually given on drawings of bevel gears and a direct reading made by dial indicator. The gage can be used to check dimensional accuracy of addendum cone (gear face) as related to thrust face of

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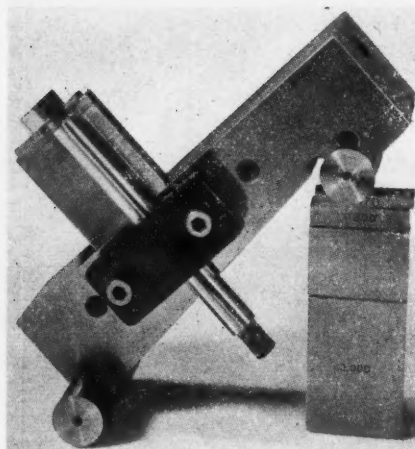
QUALITY

- ★ END MILLS
- ★ MILLING CUTTERS
- ★ SPECIAL TOOLS
- ★ REAMERS
- ★ COUNTERBORES

FALCON TOOL CO.

DETROIT, MICHIGAN

WIRE FOR DETAILS AND DELIVERY DATA—
WE'LL GIVE YOU QUICK ACTION!



Herkimer Self-Contained Model Sine Bar Gage

hub, check accuracy of cone angle, and check runout of gear face.

The Herkimer Sine Bar Gage is offered in two models, one for use on a conventional surface plate and the other

being a self-contained unit with its own base, set-up anvil, gage rod holders, and so on.

R & M Machine Drive

The illustration shows the R & M Machine Drive for use on both old and new machines which is now being offered by Robbins & Meyers, Inc., Dept. H, Springfield, Ohio. The unit is powered by either a single or two-speed Robbins & Meyers 3-phase, 220-440-volt induction motor ranging in horsepower from 1 to 7½. The drive can be readily mounted on a machine by simply drilling four holes and inserting four cap screws.

Reduction in the speed of the R & M Machine Drive is obtained through a gear case designed as an integral part of the motor head. A gear shift lever with finger-tip control is located within easy reach of the operator and provides three speeds with a single speed motor and six speeds with a two-speed motor. Gears are of high grade heat-treated steel, with edges rounded to ensure smooth, easy shifting, and are amply

It's Adjustable

NEW

GREEN

Master Feed Finger

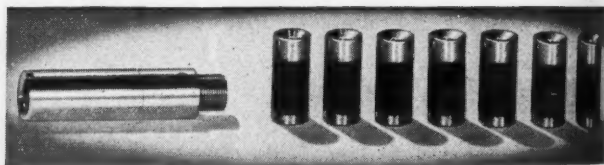
for most

MAKES AND SIZES

OF SINGLE AND

MULTIPLE SPINDLE

SCREW MACHINES



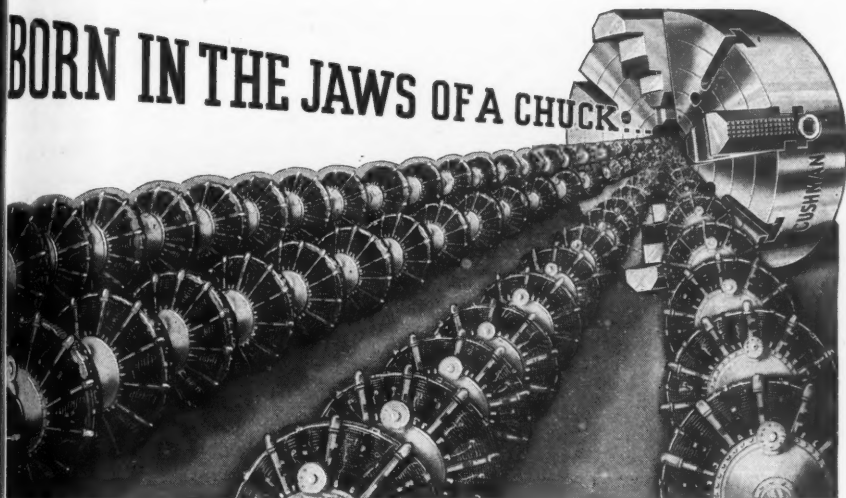
Adjustment is merely a matter of selecting insert that covers range in which stock size falls. Slip insert into finger, screw on tensioning ring, place it on machine and it's ready for work.

Elastic pad in finger simplifies loading of stock, absorbs shock, can't scratch bar stock, holds softly but firmly. Solid finger contains no moving parts or springs to wear out or break.

Write for folder

GREEN MFG. CO., Rockford, Illinois

BORN IN THE JAWS OF A CHUCK!



ALL PRECISION and a yard wide

If you are a manufacturer of aircraft engines, Cushman Chucks are helping you to keep 'em coming and "keep 'em flying". Cushman Precision and Cushman ability to "take it" from three shifts of hard-driving operators are helping you to keep ahead of stepped-up production schedules.

This may be the first time you have really used the great reserve of strength and sustained accuracy

built into every Cushman Chuck. And we consider it part of our contribution to the winning of this war to help you get both maximum production and maximum service life from your chucking equipment.

We will be glad to send you a supply of "Chuck Check" maintenance cards for distribution in your plant. You may find them particularly useful in training new operators.

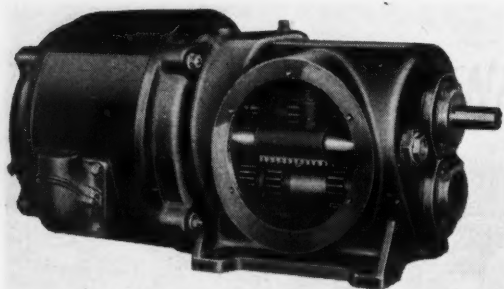
CUSHMAN

THE CUSHMAN CHUCK CO.

HARTFORD, CONN.

CHUCKING ENGINEERS

SINCE 1862



R & M Machine Drive

Medart 2 & 2 Universal Bar and Tube Straightening, Sizing, and Polishing Machine

The illustration shows the Medart 2 & 2 Universal Bar and Tube Straightening, Sizing, and Polishing Machine which has been placed on the market

by The Medart Co., Potomac and De Kalb Sts., St. Louis, Mo. Sturdily built for continuous heavy duty service, the machine is said to incorporate all necessary features of safety, economy, and ease of operation, and is made in four sizes to accommodate every size of bar and tube from $\frac{1}{8}$ to 6 inches in diameter. The compact size of the machine makes possible the use of a minimum of floor space for installation.

By means of the Medart 2 & 2 Universal, output speeds of from 50 to 1,000 feet per minute can be obtained, depending upon the conditions involved and the gear ratios specified for the four-speed

keyed to the shafts. All gears operate in a continuous bath of oil, which is easily checked by a conveniently located oil level indicator. The motor itself is provided with air vents for cooling and is designed to stand reversal without excessive heating by plugging at light loads for short periods.

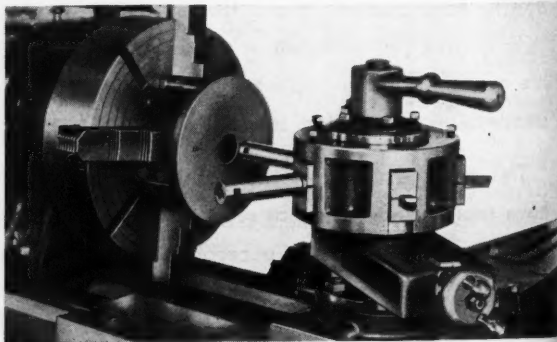
The mounting bracket of the R & M Machine Drive is of heavy cast iron with ribbed channel design which is said to prevent vibration. A special bracket design is available for each application of the drive, since no one type of mounting can be made that will fit all types of machines.

5-STATION LATHE TURRETS provide increased production and better finish

TOOl blocks are interchangeable in five positions. Bottom half of tool block oscillates in turret body and allows for minute adjustment of tool. Two set screws rigidly hold boring bar or tool bit. Index plate has ten stops for ten different tool settings. Tool holders and boring bars are standard. Available in 3 sizes.

Save tool bits and increase production at lower costs.

Write for folder — today!



Typical application of No. 2 Turret applied to modern 14" Geared Head Engine Lathe.

AUTOMATIC MACHINE & TOOL CO.
132 Charles St. Auburndale, Mass.

Due to many new and present oil pro

Unless quickly you re equipm

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, 1942



Discuss your Cutting Problems with a Cities Service Lubrication Engineer!

Due to war production and priorities, many manufacturers today are using new and unfamiliar materials—and each presents a new and unfamiliar cutting oil problem.

Unless these problems are solved quickly and economically, they can cost you real money in lost time, damaged equipment and poor results.

Why not have a Cities Service lubrication engineer go over your cutting oil problems? You'll find he has up-to-the-

minute information that can help you get maximum production . . . maximum tool life . . . and a better finish.

This friendly personal service is yours without cost or obligation. All you need to do is write on your own letterhead to the nearest Cities Service office listed below.

We shall be glad to send you an informative booklet, "Metal Cutting Lubrication." Just check the space indicated!

OIL IS AMMUNITION — USE IT WISELY!

Write to —
CITIES SERVICE OIL COMPANY
Room 1326, Sixty Wall Tower, N. Y.
or any of the following offices:
CHICAGO • CLEVELAND • ST. PAUL
KANSAS CITY • BOSTON • TORONTO
or to
ARKANSAS FUEL OIL COMPANY
SHREVEPORT • ATLANTA • BIRMINGHAM



Please send me information concerning your Engineers' Lubrication Service. ☐

Please send me your booklet, "Metal Cutting Lubrication." ☐

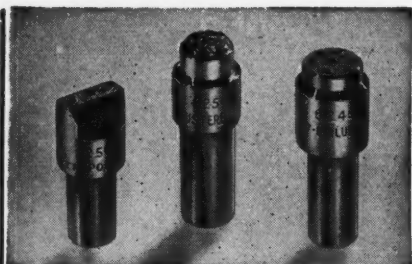
Name

Firm Name

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City State M. M.

A LUBRICANT FOR EVERY INDUSTRIAL NEED



MEYERS "Dia-Brasive" MULTIPLE DIAMOND POINT DRESSERS

For Efficient, Economical Service

With "Dia-Brasive" Multiple Point Dressers, numerous sharp points are always exposed to the work, or face of wheel. New points can be secured by turning dresser a quarter or half turn. The small diamonds are more reasonable in price, and remain sharp longer, than large stones. We also make a complete line of single point diamond dressing tools. Special dressers built to order. Write for new literature.

W. F. MEYERS COMPANY, Inc.
Dept. MS., BEDFORD, IND., U. S. A.

MUNDING BENCH RADIAL DRILL

Combines the convenience and accuracy of a sensitive drill, the range and capacity of a large drill, with the speed and flexibility of a radial.



Finger-tip selection of speeds.
Table swivels and tilts to any angle.

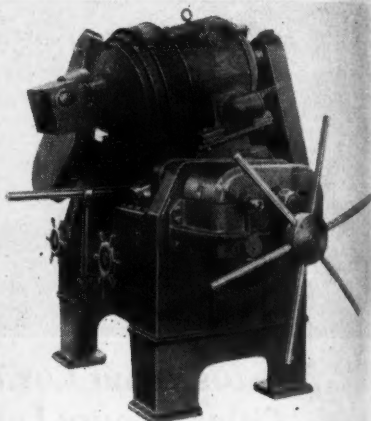
UNEQUALLED RANGE

Drills to center of 48" dia. circle, 18" travel of head on arm. 17" travel of arm on column. $\frac{3}{4}$ " drill capacity. Speeds: 175 to 3675 r.p.m.

Write for details.

MUNDING MFG. CO.
703 East Colorado Blvd. Glendale, Calif.

built-in shifts. An unusual range of conditioning applications is achieved through extremely flexible adjustments built into the machine. These adjustments have, in turn, been made one by mounting each motor on the same adjustable member which supports its driven roll. Thus, each roll with its supporting frame, silent chain and gear drive, and motor composes an integral



Medart 2 & 2 Universal Bar and Tube Straightening, Sizing, and Polishing Machine

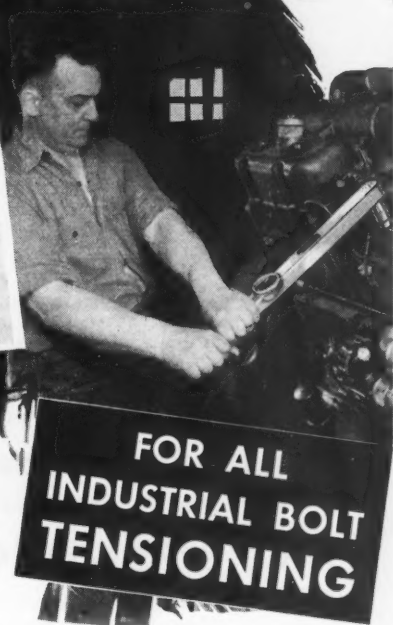
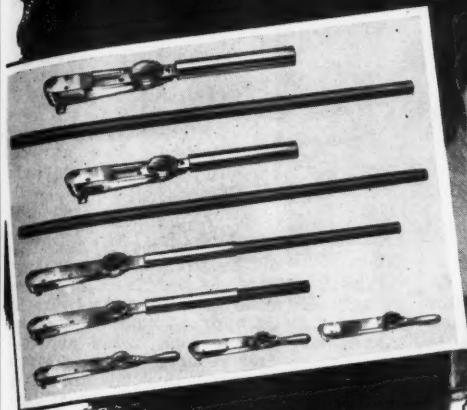
unit which may be freely adjusted with relation to the opposing roll unit and the guides. Rolls are of a patented concave and straight design.

Beatty Model 100 Hydraulic Extruding Press

The illustration shows the Beatty Model 100 Hydraulic Extruding Press which has been brought out by the Beatty Machine & Mfg. Co., Hammond, Ind. Of high production capacity, the press is a self-contained unit with rigid one-piece frame.

The material cylinder of the machine is horizontally mounted to provide easy access to the loading chamber. A duplex pumping unit provides for rapid movement of plunger of cylinder on advance and return stroke, thus decreasing loading time to a minimum. A variable speed control feeds material at the rate required for various sizes of electrodes.

Snap-on TORQOMETERS



For every production and maintenance operation requiring accurate tension . . . delicate tensioning on fine assembly work . . . adjusting tool set-up to extreme accuracy . . . preventing mechanical distortion in cylinder

heads, bearings, steam flanges, transmission systems . . . Snap-on Torqometers eliminate guess work and make precision tensioning as easy as reading a dial. Results are predetermined . . . accuracy is sealed in.



Snap-on Torqometers are available in a wide range of capacities, from 150 in. lbs. to 2,000 ft. lbs. For full information on Torqometers and 3,000 other Snap-on tools, write . . .

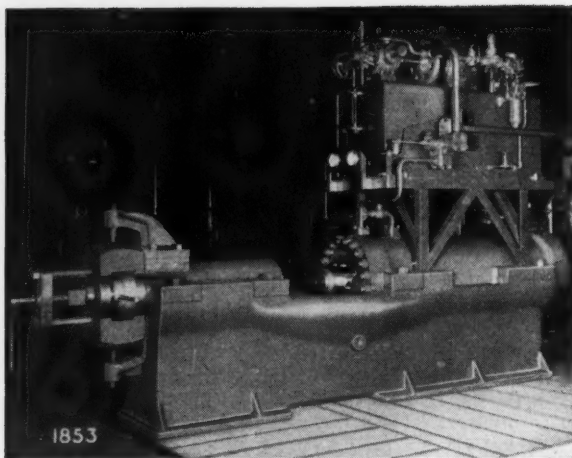
Snap-on Tools

for Production, Service, Maintenance

SNAP-ON TOOLS CORPORATION

8032-H 28th Avenue

Kenosha, Wisconsin



Beatty Model 100 Hydraulic Extruding Press

The material cylinder, which is 50 inches long, is made of cast steel and lined with a renewable heat-treated pressure-tight iron liner. The press is also available with 72-inch long material cylinder, which provides space for three 16-inch slugs.

The complete press is designed to pro-

vide a working pressure of 10,000 lb. per square inch on the coating material in the material chamber. A manual adjustment located within easy reach of the operator provides for pressure and velocity changes as required. The press is equipped with duplicate heads which can be alternated by removing coupling pin, thus eliminating loss of time during renewal of packing. The Beatty Model 100 Extruding Press is actuated by a double-acting hydraulic cylinder. The hydraulic pumping equipment, including pumps, relief and control valves, oil reservoir, and pressure gage, are mounted directly above the main cylinder out of the range of damage from floor conveyances.

Today's answer to MORE PRODUCTION

IF you want to step up production as much as six times . . . cut down grinding time . . . and lengthen the service life of cutting tools . . . then switch to W-S cemented carbide tipped tools. Each one is tipped with the correct grade of CARBOLOY best suited to do a cutting job on the metals for which the tools are ordered. (Other brands of carbide can be specified.)

We specialize on cemented carbide tools exclusively. We list as standard many tools formerly in the "special" class. Prompt shipment from stock on many types. Catalog 142 sent FREE. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Wire or phone your requirements and priority rating.

WENDT SONIS

CARBOLOY CUTTING TOOLS

Centers • Flute Drills • Core Drills • Counterbores • Spot Facers
End Mills • Reamers • Hollow Mills • Lathe Bits • Special Tools



W-S Standard Reamers. Tapered and straight shank types. $\frac{1}{4}$ up to $1\frac{1}{2}$ "

W-S Carbide Tipped Centers. Morse, Browne & Sharpe and Jarno Tapers.

W-S Carbide Tipped Core Drills. Straight and tapered shanks. Sizes: $\frac{1}{8}$ to $1\frac{1}{2}$ "

**For Better
FINISHING, DE-BURRING, POLISHING
IN A FRACTION OF THE TIME**

WELDON ROBERTS
Brightboy

The Soft Rubber Binder cushions the Abrasive



Accuracy and results in finishing, de-burring and polishing operations NOW being achieved with Weldon Roberts BRIGHTBOY by an increasing number of war industries, at a fraction of the time formerly required.

BRIGHTBOY'S abrasive, cushioned thru-out in resilient rubber, has brought about this quicker method for metal working . . . often completing in one operation work which formerly required numerous set-ups. On both hand and machine work, BRIGHTBOY'S abrasive recedes into the rubber binder, producing an effect different from

any other abrasive material. Particularly effective in close tolerance operations, with a minimum loss of dimension.

BRIGHTBOY removes light digs, tool and heat marks; cleans welded and soldered joints; finishes dies and tools; de-burrs light stampings and machined parts.

There is no waste with BRIGHTBOY . . . every bit is usable. Easy to handle—no special preparations or set-ups necessary. Available to war industries through mill supply distributors. Ask for the booklet on "Methods and Applications" or write us direct for further information if your dealer cannot supply you. Our representative will be glad to confer with you on your finishing problems and requirements.

**BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.**

Newark, N. J., U. S. A.

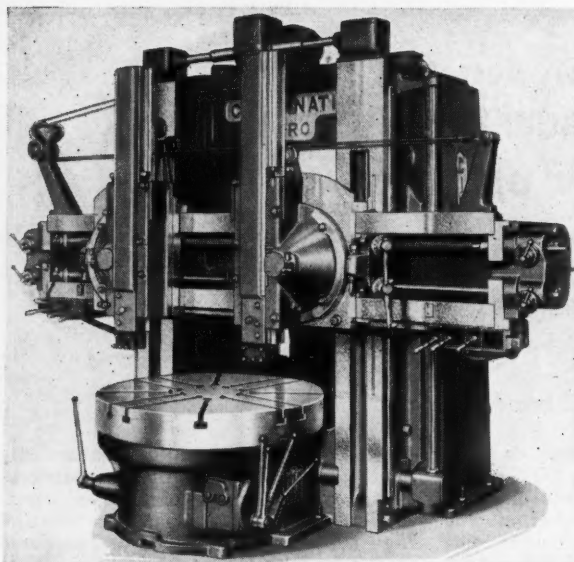


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WHEELS · DISCS
STICKS · TABLETS

Brightboy

REG. U. S. PAT. OFF.



Cincinnati Hypo Vertical Boring Mill

Cincinnati 54-Inch and 64-Inch Hypo Vertical Boring Mills

The Cincinnati Planer Co., Cincinnati, Ohio, announces a line of 54 and 64-inch Hypo Vertical Boring Mills which are said to have many important features formerly found only on larger size mills.

Outstanding design features of each size machine include table of extra depth mounted on Timken anti-friction bearings, supported by flat track with hold-down gibs; rapid traverse for each head, including side head; one-piece bed and speed box construction; wide face steel table gear; transmission gears of heat-treated alloy steel; Timken bear-

ings for all shafts, with two sets of double-row bearings on main shaft; pyramid-type housings with broad face and long base; ratchet handles for cross and down feeds for fine adjustment; ram of box section made from Meehanite iron and equipped with toolholders made from solid steel forgings; 12-position square turret toolholder on side head; box form cross rail; feedbox bolted to each end of rail, containing complete feed, rapid traverse, and reversing mechanism; graduated scales on cross rail and on all rams, and automatic lubrication for

complete main drive, table, and spindle.

The cross rail is mechanically clamped to the housings, with rail heads square locked throughout with heavy gibs. Power for raising and lowering the rail is transmitted from a separate constant speed motor mounted on butt arch which is controlled by push-button pendant control. The elevating mechanism of the rail has a limit switch which stops it when it reaches its highest position.

Safety features provided include an arrangement whereby the side head can be raised or lowered to its extreme limit without damage to work or injury to operator when rail heads are moving horizontally with independent motor and

CARBIDE TOOLS

**HAVE FAR GREATER DEGREE OF SHARPNESS
WHEN YOUR DIAMOND WHEELS ARE LUBRICATED WITH
STADOIL DIAMOND LAPPING OIL**

The Genuine—gives greater wheel production and much longer wheel and tool life

ORDER thru your Mill or Industrial Supply Jobber and unavailable
—then mail your order direct to

Stadoil Manufacturing Company

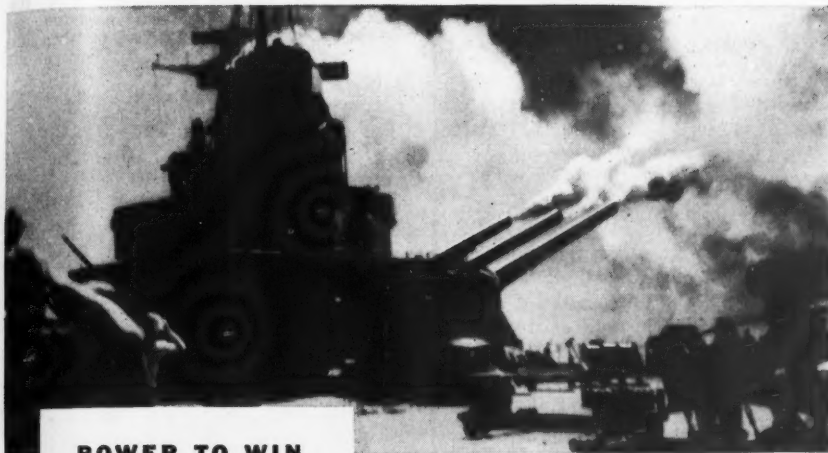
Dallas, Texas

Los Angeles, California

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otor air



POWER TO WIN

depends on power to produce.
For stepped-up machine out-
put in METAL CUTTING
operations use . . .

SINCLAIR CUTTING OILS and COOLANTS.

These oils promote faster
machining speeds, higher
accuracy and finish, and lower
cost per unit handled.

Write for "The Service Factor"—a free
publication devoted to the solution of
lubricating problems.



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FAIR BUILDING
FT. WORTH

Remember

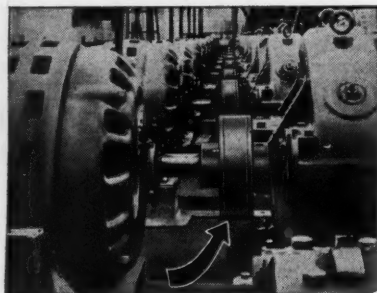
KANTI-LEVER COUPLINGS

Keep your Productive Machines
out of the Repair Shop

Shutting down a productive machine for repairs is a serious thing today—why run this risk when the KANTI-LEVER COUPLING will enable you to avoid it? The KANTI-LEVER not only protects you against the evils of shaft misalignment like the ordinary Coupling, but it injects a resiliency into the driving troque of your Motors that absorbs the reoccurring load shocks and the torsional vibration that are the main causes of wear, fatigue and final failure of all types of machinery. See the cut below showing 70 KANTI-LEVERS that have run continuously for over 18 years and paid back their cost many times by rendering uninterrupted operation and greatly reducing repairs.

Send for Bulletin 28-M describing

Kanti-lever Couplings



BROWN
ENGINEERING CO. PHILADELPHIA
READING, PA.

pump unit to the outer limits of the side head. A turret head can also be added to the rail. Thread-cutting attachments are available for any or all heads.

Sioux Wet Valve Seat Grinding Machine

The illustration shows the Sioux Wet Valve Seat Grinding Machine for aircraft radial motors which has been



Sioux Wet Valve Seat Grinding Machine

brought out by Albertson & Co., Inc., Sioux City, Iowa. The machine, which is finished in machine tool grey, is of sturdy construction with welded steel frame and all panels of heavy gauge metal. A handy shelf with metal pins is provided for holding grinding wheels and wheel holders and retaining holes for pilots. The machine is also equipped with a fully adjustable shaded light and three-prong twist lock electric connections. Additional standard equipment includes a dressing tool and power drive for wheel dressing.

The Sioux Wet Valve Seat Grinding Machine is designed to accommodate all size radial cylinders up to 6 $\frac{7}{8}$ -inch skirt diameter. Quickly adjustable clamps

READY



TO GO TO WORK
Immediately!

**Many Sizes of Super, Standard
Carbide Tipped Reamers Are
Available from Stock**

Many sizes of Super, Standard Carbide Tipped Reamers are available from stock for immediate delivery; other sizes are on hand in semi-finished form ready for completing to required sizes for quick delivery.

Super, Standard Carbide Tipped Reamers applied to your work will help turn out more pieces in less time, reduce the cost of your production, and maintain a higher degree of accuracy.

Inquire now about sizes available ready to go to work on your production and ask for Bulletin R-1 on carbide tipped reamers.

● **SOLID TYPE**

STRAIGHT SHANK

TAPER SHANK

SUPER TOOL CO.

21640 HOOVER RD.

DETROIT, MICH.



CARBIDE TIPPED TOOLS

FOR TURNING - FACING - REAMING - SPOTFACING - BROACHING
FORMING - GRINDER RESTS - WEAR PARTS - BORING - MILLING - DRILLING
GROOVING - COUNTERBORING - SHAVING - CENTERS - SPECIAL PURPOSES

hold the cylinder firmly to the work table, which, being of special construction, can be turned and rotated for grinding both exhaust and intake valve seats without removing cylinder.

Coolant is supplied to the valve seat from the bottom, the coolant being forced between the grinding wheel and valve seat so that all cuttings are flushed away from between wheel and valve seat, thus eliminating scratching of seat and wheel loading. The machine is equipped with dependable coolant filter, pump, and pump motor with independent button switch and safety light, and five-gallon supply tank with large bottom drain cock.

The dressing tool of the machine is of substantial construction and is adjustable from 0 to 90 deg. with the feature of synchronizing adjustment. The tool is amply guarded and arranged so that dust is drawn into a large capacity metal suction box with removable filters. A power drive with separate switch control is a part of the dressing fixture.

The Sloux Wet Valve Seat Grinding Machine occupies a floor space of 30 x 36 inches and has a shipping weight of 510 lb. Working height, 32½ inches; shelf height, 41½ inches.

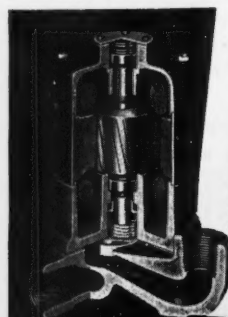
Ceco Automatic Universal Precision Swiss Type Screw Machine

The Ceco Automatic Universal Precision Swiss Type Screw Machine illustrated herewith, product of The City Engineering Co., 44 Webb St., Dayton, Ohio, is designed to efficiently produce extremely accurate parts of various sizes and shapes at high speeds.

The machine employs four standard tool bits which turn and face the work as the revolving bar stock is being fed through the work guide bushing just back of the bits, the guide bushing serving very much the same as a steady rest on a toolroom engine lathe. The bits are advanced radially to the work and retracted when not in use by means of flat cams mounted on a single camshaft located at the back of the machine. These cams may be mounted or dismantled without removing the camshaft.

Accuracy of diameters and lengths of shoulders are maintained by means of double micrometer adjustments provided on the machine. Odd shapes, such as radii, complicated forms, and tapers, can be produced by generating the flat cams mounted on the camshaft.

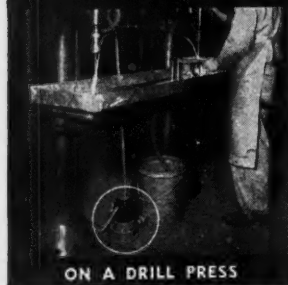
Drilling, reaming, counterboring, tap-



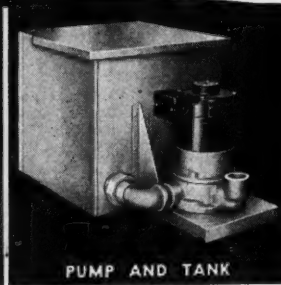
The Coolant Pump For Every Job— **BRADY-PENROD MODEL 600**

Durable! This pump stands up under hard use. Hydraulic efficiency as high as 70%. Quickly installed by any shop man at little cost and easily moved from one job to another. Controlled flow—60 g.p.h. with ¾" tubing to 1200 g.p.h. with 1" pipe. ⅓ H.P. NEMA motor meets any demand with negligible current cost. **Tank With Built-in Baffle.** 12" x 12" heavy galvanized sheet iron with baffle separator to collect heavy chips. Painted machinery gray outside. Removable lid for cleaning without disconnecting return piping.

Write or wire today to:
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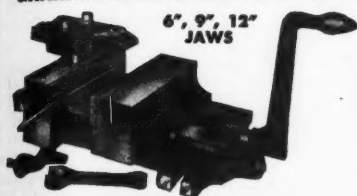


PUMP AND TANK



ON A LATHE

GRAHAM MULTI-PURPOSE VISE



6", 9", 12"
JAWS

Time is short—this vise saves it! By means of special attachments and jaws, it meets a vast variety of repeat-operation and special holding needs that would otherwise require jigs. As a plain vise, its flush, square and parallel accuracy make it ideal for general work on miller, drill press, radial, planer, shaper grinder.

KNURL HOLDER FITTING LATHE TURRET

Using only a pair of straight-cut knurls, this tool can be adjusted to cut straight, spiral or checkered patterns of endless variety. Can pass over stock of larger diameter than knurled section. Shank made to fit your turret.

Illustrated price circulars upon request

GRAHAM MFG. CO.

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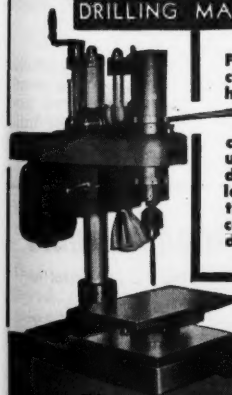
EAST GREENWICH, R. I.

AS Sensitive AS A SURGEON'S FINGERS

The HAMILTON
MUEHLMATT

Super Sensitive

DRILLING MACHINE



For utmost precision drilling... holes .004 to 5/16 inch diameter. Self-contained drilling unit; swings radially on column; locks to any position. Use it to conserve small drills.

Dept. S-8

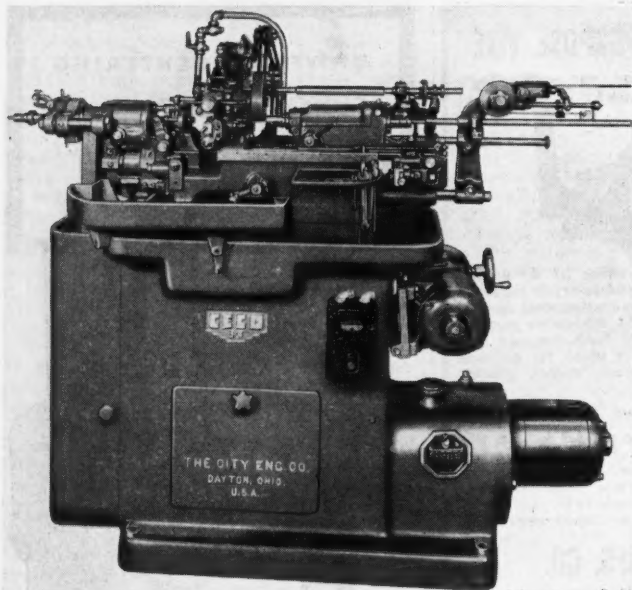
The Hamilton Tool Co.

UNIVERSAL CENTERING CHUCKS AND STANDARD CHUCKS STEP UP ACCURACY —INCREASE SPEED



Left: Universal Standard Collet Chucks hold tools in a grip as strong as solid steel itself. Nut for spanner wrench. The ideal tool for holding end mills, keyway cutters, drills, etc. Write for facts.

UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH, MICH.



Ceco Automatic Universal Precision Swiss Type Screw Machine

chine is at rest or in motion. Motors are said to have no speed fluctuations at any setting. Changes in voltage or load are said to have a very minor effect on speed.

Specifications of the Ceco Automatic Universal Precision Swiss Type Screw Machine are as follows: maximum diameter of bar admitted, $\frac{3}{4}$ inch; maximum turning length with bell cam, 2 $\frac{1}{2}$ inches; headstock spindle speeds, 63 to 6,100 r.p.m.;

camshaft speeds, $\frac{1}{4}$ to 20 r.p.m.; camshaft motor, $\frac{1}{4}$ h.p.; work spindle motor, $1\frac{1}{2}$ h.p.; net weight of machine, approximately 1,594 lb.; shipping weight, approximately 1,900 pounds.

ping, threading, and kindred operations are performed by means of attachments mounted on end of machine. Screw heads are slotted by pickup arm carrying work to attachment and cutter mounted on front of machine.

The Ceco Automatic Screw Machine is equipped with an independent gusher oil coolant pump, independent adjustable speed motor camshaft, and independent adjustable speed motor to work spindle. The output speeds of the motors operating the camshaft and work spindle may be increased or decreased instantly by the turn of a handwheel to any r.p.m. over an infinite range, changes in speed being made while ma-

"Tal's Prestal" Hydraulic Portable Pipe Bender

Known as "Tal's Prestal," a hydraulic portable pipe bender designed to bend, without heating or filling, all iron and steel pipe as well as solid bars of mild steel of from $\frac{3}{8}$ to 2 inches in diameter



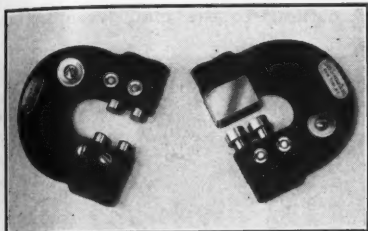
VERTICAL to HORIZONTAL in one minute

A combination Centerless Feed Polishing Machine . . . Vertical or Horizontal Belt Grinder . . . Surfacar . . . Polisher. Handles cylindrical work, $\frac{1}{8}$ " to 1" dia. Is fed automatically—no centering, no chucking. A handy machine!

TOOL AND CUTTER GRINDERS, SENSITIVE DRILLS.

PRODUCTION MACHINE CO.
GREENFIELD MASSACHUSETTS

ADJUSTABLE LIMIT SNAP GAGES



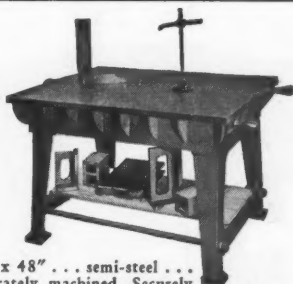
Many plants engaged in war work are using Adjustable Limit Snap Gages. Our ATLANTIC gages are made of MEEHANITE castings for stability and rigidity. WRITE TODAY FOR FOLDER. PROMPT DELIVERIES TO PLANTS FURNISHING PREFERENCE RATINGS.

Write, wire or telephone CA6-1464 for prompt service.

GEO. SCHERR CO.

130 Lafayette St. New York, N. Y.

MILWAUKEE SURFACE PLATES



36" x 48" . . . semi-steel . . . accurately machined. Securely mounted cast legs are machined and provided with adjusting screws for perfect alignment. Shipping weight, 1300 lbs. Also larger or smaller plates with planed or scraped surface. We also manufacture angles and parallels as shown underneath surface plate.

Write for details.

J. C. BUSCH CO.

Engineers and Machinists Since 1907

126 E. PITTSBURGH AVE., MILWAUKEE, WIS.

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BORING, FACING and INTERNAL THREADING TOOLS

For holes from $\frac{1}{8}$ " upward, 15 different sizes

**Made of Super-High-Speed Steel
Specially Heat Treated**

Indispensable for your JIG BORER. The worm-like spiral of the boring heads provides a long, useful cutting surface. Their use insures perfect fitting threads. Correctly designed for precision work.

Write for complete data.

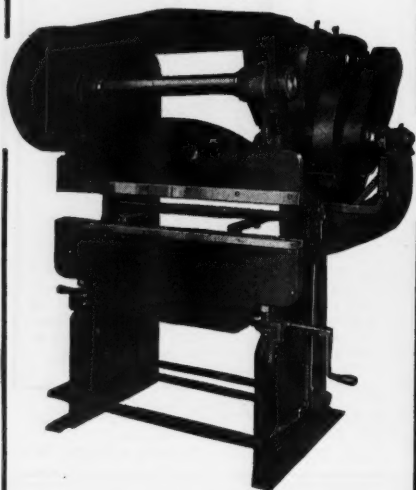
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738 Broadway, New York, N. Y.



CHICAGO STEEL PRESS

No. 253



SPEED WAR PRODUCTION OF SHEET METAL WORK

USE FOR...

1. FORMING
2. EMBOSSEING
3. MULTIPLE PIERCING
4. NOTCHING
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of Ammunition Cases, Bomb Box Liners,
Bomb Fins, Aircraft Parts and Many
Other Offense Products.

The No. 253 CHICAGO STEEL PRESS
is accurate, compact, and ruggedly
constructed of highest quality materials.
Sizes 4, 5 and 6 ft. capacities up to 10
gauge.

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**DREIS & KRUMP MFG.
Company**

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CHICAGO

ILLINOIS

is now being marketed by Tal's Prestal
Bender, Inc., 759 N. Milwaukee St., Mil-
waukee, Wis. The unit is said to pro-
duce bends up to 180 deg. in one simple
operation, all bends being made without
kinks or wrinkles and with a minimum
of distortion.

According to the manufacturers, the



"Tal's Prestal" Hydraulic Portable Pipe
Bender

ease and uniformity with which bends
are produced is due to the specific con-
struction of the various size forming
heads used with the unit which are
moved forward toward the pipe by a
hydraulic piston operated by a pump
handle at the rear of the assembly. Very
handy in size (32 inches long overall)
and weighing only 98 lb. with the larg-
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without bolting.

In addition to use in bending pipe and
bars, Tal's Prestal Hydraulic Pipe
Bender can also be employed for press-
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STOP DUST

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DUSTKOP

Dust from tool, surface, bench and pedestal grinders is easily and inexpensively handled by DUSTKOP . . . Compact, self-contained (no connecting with central system) . . . Operated by 1/4 hp motor and driving multiple blade fan . . . Easily removable spun-glass filter cleans and returns air to room . . . Low Cost . . . Immediate deliveries on high priorities. Write for Bulletin A-500.

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TYPE C

WRITE
FOR
CATALOG M. A.

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**POWERFUL
ECONOMICAL
RELIABLE
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DRIVES**

For your slow speed machines, requiring 1/50 to 7 1/2 H. P., at speeds as low as .08 r.p.m., which will give years of trouble free service.

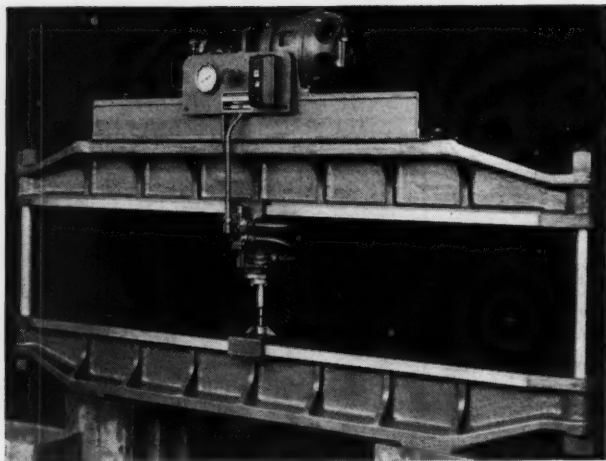
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BELTS—PULLEYS—CHAINS—
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one of the 47 types of



Janette Motorized Speed Reducers

Janette Manufacturing Company

556-558 West Monroe Street Chicago, Ill. U. S. A.



Lake Erie 10-Ton Hydraulic Riveting Machine

A 10-ton hydraulic riveting machine having 9-foot 10-inch clearance between tie rods for handling large work is announced by the Lake Erie Engineering

Lake Erie 10-Ton Hydraulic Riveting Machine

Corp., Buffalo, N. Y. The machine is self-contained, including pumping unit and surge tank mounted on top.

Upper and lower cross members of the machine are of webbed I-beam construction to assure rigidity at all points laterally. The riveter proper is mounted on the upper cross member and the anvil on the lower member. A manually-operated valve controls pressure of the riveter on down and return strokes.

Specifications of the machine are as follows: distance between beams, 21 $\frac{1}{2}$ inches; distance between tie rods, 9 feet 10 inches; stroke, 3 inches; diameter of ram, 5 inches; distance floor to top of tie rods, 4 feet $\frac{1}{2}$ inch; overall length, 10 feet 6 inches.

Cut Dressing Costs with WILLEY'S



**No resetting required.
Accurate, precision dressing.
For all makes of grinders.
Lower production costs.**

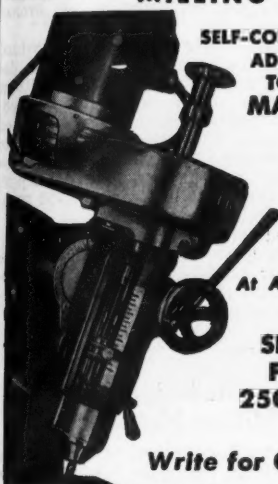
Layer upon layer of natural, whole diamonds, in tungsten carbide matrix. Many sharp cutting points in constant contact with grinding wheel during the entire life of the tool. Make comparative tests, for quality and cost per dress-

ing. 4 standard sizes. Prompt shipment. Prices include holder. Order today! Ask for Bulletin 142, covering Willey's Standard Tungsten Carbide Cutting Tools and Torpedo Type Wheel Dressers.

No.	Usable Contents of the Diamonds		QUANTITY PRICES				Wheel Diameter
	Diameter	Length	1-25	26-50	51-75	76-100	
W-3	$\frac{1}{8}$	$\frac{1}{4}$	\$11.00	\$10.00	\$ 9.00	\$ 8.00	6 to 12
W-4	$\frac{1}{4}$	$\frac{3}{8}$	13.00	12.00	11.00	10.00	12 to 20
W-5	$\frac{3}{8}$	$\frac{1}{2}$	15.00	14.00	13.00	12.00	20 to 24
W-6	$\frac{1}{2}$	$\frac{3}{4}$	17.00	16.00	15.00	14.00	24 to 42

WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway, Detroit, Michigan

EKLIND UNIVERSAL MILLING HEAD



SELF-CONTAINED.
ADAPTABLE
TO ANY
MACHINE

• Mills
Drills
Bores
At Any Angle

• SPEEDS
FROM
250-4000

• Write for Circular

UNIVERSAL HIGH-SPEED TOOL CO.
547 W. Washington Blvd. Chicago, Ill.

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AVOID HEAT-FAG--USE
MORTON'S
SALT TABLETS

SALT LOSS... Slows Up Production

Salt lost by sweating must be replaced or workers tire quickly — accuracy and alertness are dulled. Lowered efficiency, mistakes and accidents take their toll.

MORTON'S Salt Tablets

Install Morton's Dispensers by all drinking fountains, so workers can take tablets to replace the salt lost by sweating.

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Salt Tablets, Case of 9000 - \$2.60
Salt-Dextrose Tablets,
Case of 9000 - - - - \$3.15

Dispensers

500-tablet size - - - - \$3.25
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MORTON SALT COMPANY, Chicago, Ill.

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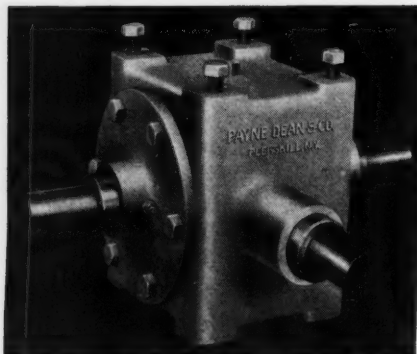
GRANT RIVETERS



• Pioneers in the riveting field. Head rivets from smallest to $\frac{3}{4}$ " diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles.

Write for literature—and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
96 Stillman Ave. Bridgeport, Conn.



Dean Angle Drive

Dean Angle Drive

The Dean Angle Drive shown here, product of Payne Dean & Co., Peekskill, N. Y., is a very rugged miter gear drive for changing the direction of one or more shafts through a 90-deg. angle in either a vertical or horizontal position. The drive consists of a cast iron casing in which is mounted a pair of steel miter gears immersed in ordinary

transmission grease. All shafts of the unit are equipped with grease retainers, thus making the casing grease-tight, and operate on self-lubricating bronze bearings.

The Dean Angle Drive is provided with a gear ratio of 1 to 1 and is designed for constant and intermittent duty either by power or hand operation, gear thrust being absorbed by hardened steel washers. The drive is adapted to speeds from 50 to 750 r.p.m. and may be modified for speeds up to 1,200 r.p.m. Rating of the unit is 5 h.p. at 750 revolutions per minute.

Furnished without mounting base unless specified, the Dean Angle Drive is designed for ready mounting in any position through the use of ordinary channel iron or angle section.

Waltham Redesigned Thread Milling Machine

The illustration shows the redesigned thread milling machine which is now being marketed by the Waltham Machine Works, Waltham, Mass. Especially suitable for small work, the machine is completely motorized, being

Rawhide HAMMERS Rawhide MALLETS



• Genuine Java Water Buffalo Hide replaceable faces in malleable head.

No.	Dia. in ins.	Wgt. in lbs.
0	1	½
1	1¼	1½
2	1½	1¾
3	1¾	2¼
4	2	4
5	2¾	5½



• A finely balanced Tool with tough, resilient Java Water Buffalo Rawhide heads.

Not Loaded				Loaded Mallets			
No.	Dia. Ins.	Lgt. Ins.	Wt. Ozs.	No.	Dia. Ins.	Lgt. Ins.	Wt. Ozs.
0	1	2½	2	7	1¾	3	8
1	1¼	3	3½	8	1½	3½	12
2	1½	3½	6	9	1¾	3¾	16
3	1¾	3¾	7½	10	2	3½	20
4	2	3½	10	11	2¾	4½	42
5	2¾	4¼	21				
6	2¾	4¾	23				



• These are the tough, resilient, long-lasting Rawhide faces made from specially treated Java Water Buffalo hide for use in Chicago Rawhide Hammers.

CHICAGO *Rawhide* MFG. CO.

1281 ELSTON AVE..



CHICAGO, ILLINOIS.

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Produce Accurate Parts in One Operation



ARCH TYPE

They are most satisfactory when used in WALTHAM CYLINDRICAL SUB-PRESSES where accurate alignment is not only attained but maintained. We can furnish these Subpresses in nine diameters of plungers. The arch type is used for strip punching with or without roll feed. Use the overhang type for second operation work requiring hand positioning.

Waltham Machine Works

Waltham

Massachusetts

Moore's Diamondpoint Electric Graver

Will Do That Marking Job

ENGRAVES Wood, Plastics, Glass, All Metals including HARDEST STEEL

\$22.50 Complete

Works from 110-120 v., 50-60 cycle, A.C. through a special transformer.

Order now on 10 days trial or send for literature.

Quick Delivery on Rated Orders.

William Moore Mfg. Co.

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Chicago, Ill.



MAC-ITS

Mac-it socket head cap screws are milled from the bar with die-cut threads, and heat-treated for maximum strength.

★

Other Mac-it Products Include:

Hollow Set Screws • Stripper Bolts

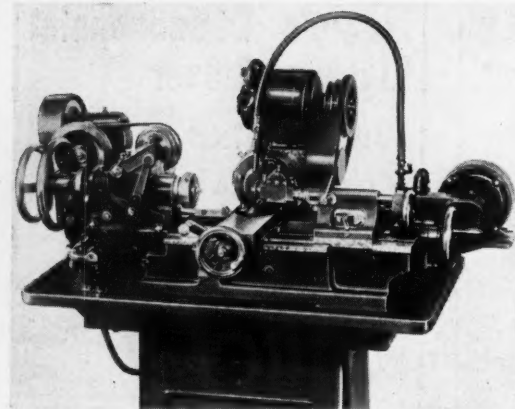
Hexagon Socket Pipe Plugs

Square Head Set Screws

Hex Head Cap Screws

THE STRONG, CARLISLE & HAMMOND CO.

1392 West Third St., Cleveland • Ohio



Waltham Redesigned Thread Milling Machine

Miller are as follows: swing over carriage, 3 inches; diameter of work for which machine is best adapted, 2 inches or smaller; length of thread that may be cut if work is held on centers, $8\frac{1}{4}$ inches; length of thread that may be cut if work is held in spring chuck, 10 inches; diameter of hole through spring chuck, $\frac{5}{8}$ inch; diameter of hole through work spindle, $\frac{3}{4}$ inch; maximum distance between centers, 12 inches; dimensions of cutter, $1\frac{1}{8}$ inches in diameter x 0.20 inch thick; floor space, 48 x 34 inches; net weight, 850 lb.;

shipping weight, 1,000 pounds.

driven by three individual motors.

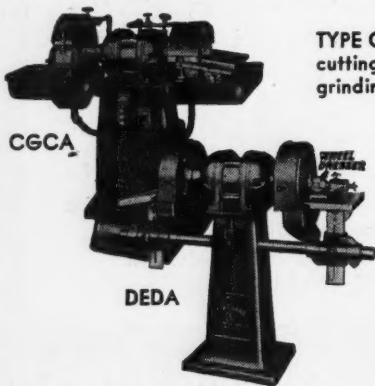
Various attachments for increasing the usefulness of the machine are available, such as attachments for use in performing relieving, internal threading, and multiple cutter threading operations. The machine can also be arranged for cam operation.

Specifications of the Waltham Thread

Weltronic Model 40 Electronic Timer and Control

Designated as the Model 40, a full-electronic timer and control for use

SHELL PRODUCTION **AT THE SPEED OF A BULLET!**



TYPE CCGA CARBIDE TOOL GRINDER to sharpen cutting tools for machining operations. Wet or Dry grinding. 12 Models . . . Reversible Motors.

TYPE DEDA DISC GRINDER for finishing Shell Base. Example: 37 MM Shell, use 3 HP with 12" discs. 105 MM Shell, use 10 HP with 18" discs, etc. Equipped with lever feed tables.

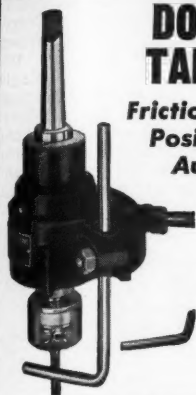
GRINDERS, Tool Post, Internal, Vertical Spindle, Bench, Pedestal. Buffing and polishing machines up to 25 HP.

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**Friction Drive and
Positive Drive
Automatic
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No. 1 Tapper drives smallest tap in softest material to $\frac{3}{8}$ " tap in steel. Simple adjustment changes light friction to positive drive or any intermediate stage.

PROMPT DELIVERY ON ALL SIZES

No. 2 Tapper Drives from $\frac{3}{8}$ " to $\frac{3}{4}$ ".
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Floating Chuck Jaw automatically centers tap.

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Made with 1 to 10 wheels.
Stamp in perfect alignment.
Shank for Hand or Press
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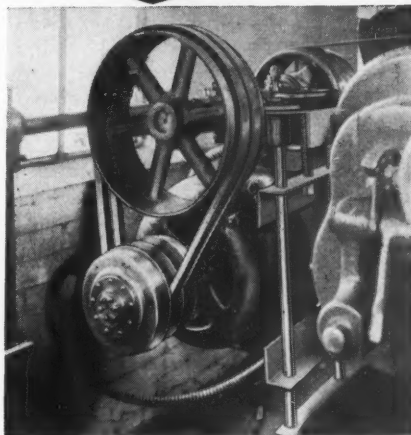
NEW Quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.

**NUMBERALL STAMP
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**INFINITE VARIABLE SPEEDS
WITH CONSTANT SPEED MOTORS**

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**HI-LO
AUTOMATIC
PULLEYS**



HI-LO Pulleys maintain constant speed at any set point and automatically regulate belt tension to load. Load is carried by cams which ride on tracks in end bells. Springs keep pulley faces up against belt at all times.

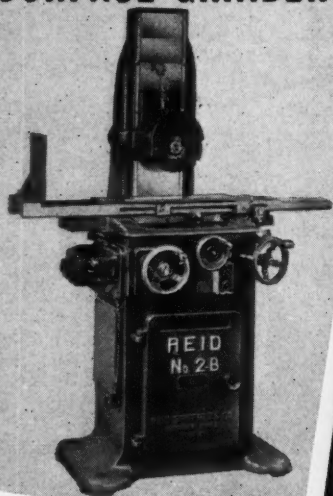
HI-LO Pulleys are easily installed on any machine and will handle drives from fractional up to 5 h.p.

Write for folder which gives sizes and prices and formulae for determining proper size pulleys.

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2853 COLUMBUS, MINNEAPOLIS, MINN.

REID All Electric SURFACE GRINDER



Applied to production and toolroom jobs, the Model 2-B above fully satisfies all possible grinding requirements within its 6" x 18" capacity.

Motorized spindle — no belts, pulleys, counterweights. Reversible motor for cross and longitudinal feed. Write for folder.

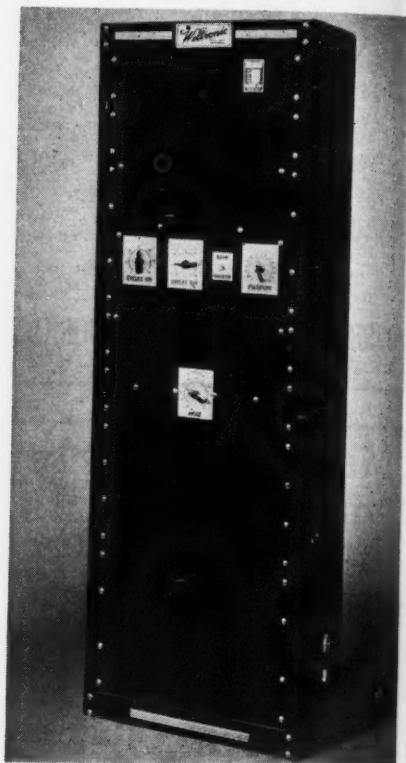
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Distributors in All Leading Cities

with seam welders as well as spot welders is announced by the Weltronic Corp., 3080 E. Outer Drive, Detroit, Mich. When used with spot welding machines, the timer is said to provide both single shot and pulsation type welding control.

Of the synchronous type and incorporating phase-shift type heat control, the Model 40 is designed to start and stop current flow at the zero point of the current wave, current duration being

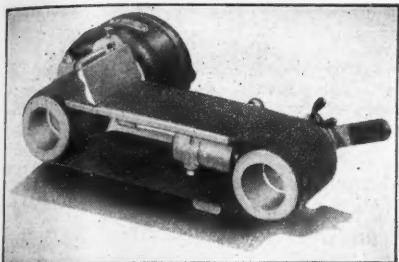


Weltronic Model 40 Electronic Timer and Control

adjustable to the exact number of cycles desired.

The cabinet housing the control is of a standard Weltronic four-panel type. The top panel is blank to permit mounting, if desired, of sequencing controls, and so on, which are sometimes used to replace limit switches, and so on, in seam welding.

The second panel is provided with



NEW ABRASIVE BAND GRINDER...

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

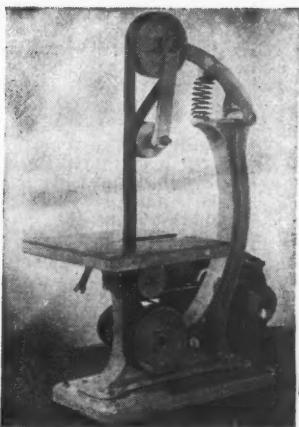
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HORMEL-M GRINDER

WALLS SALES CORP.

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NEW YORK, N. Y.



Industry's Newest Tool . . .

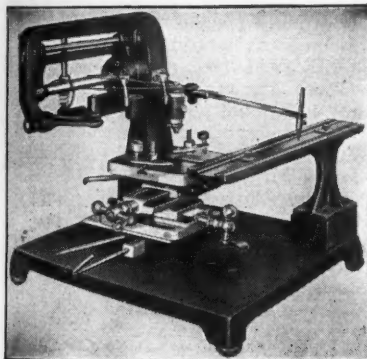
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It is a time, labor and money saver on innumerable jobs in any shop. Sharpens tools, cutters, etc., of many "kinds." F.O.B. Chicago, \$14.95.

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Unskilled labor can produce uniform engraving on brass, aluminum, soft steel, and plastic materials.

Ideal for production work on panels, bars, indicator plates, etc.

Adjustable ratio of pantograph is 1:5 and 1:2.5.

Standard machine is equipped with universal vise which handles all types of indexing, layout, and spacing work.

Write for illustrated catalog, Type A

NEW HERMES INC. 821 BROADWAY
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three dials. The left-hand dial adjusts current duration to the exact number of cycles desired. The next dial similarly controls the "cycles off" or "cool" time. Both of these dials are adjustable for any value from 1 to 30 cycles of current. The right-hand dial on the same panel controls the number of automatic repetitions of "heat" and "cool" cycles up to a maximum of 15 pulsations. Between the dials is a toggle switch which determines whether or not pulsation control is used.

On the third panel is the selector dial for the phase-shift heat control. This device permits adjustment of current value from 100 to 20 per cent of full current when used with a 440/550-volt supply. With a 220-volt supply, the range of adjustment available is from 100 to 40 per cent of full current value.

Provided in the timer is a built-in tube contactor (back of lower panel). The capacity of this contactor is the only necessary variable in the entire control for adapting the control to varying capacities of welding operations. A wide selection of electronic contactors is available to suit specific requirements.

When used for "single shot" type of spot welding, the toggle switch on the Weltronic Model 40 is thrown to the

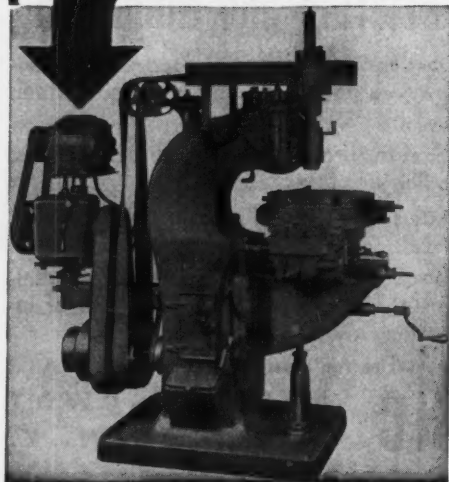
"on" position and the dial controlling the number of pulsations is set to "1." With this setting, the control is a straight synchronous spot weld timer with phase-shift heat control, particularly suitable for the welding of hard-to-weld light gauge alloy steels. To use the timer for pulsation welding, the same setting is used as for single spot welding except that the "pulsations" dial is set to the number of pulsations desired.

When used for seam welding, "heat" and "cool" controls are set to the values desired and the toggle switch is thrown to the "off" position, thus cutting out the pulsation limiting control. Heat and cool cycles will now repeat automatically until the seam weld has been completed and welding is interrupted by the welding machine start-and-stop control.

Murray Power-Driven Forge Hammer

Adaptable to a wide range of both light and heavy work, the Murray Power-Driven Forge Hammer illustrated herewith is now being manufactured by

MOTORIZED with BERKELEY DRIVES



Get more efficient use from your machines by motorizing them with BERKELEY Drives.

There is no machine in your plant that we cannot efficiently motorize. We manufacture a drive suited to your requirement. V-belt—Helical Gear—Variable Speed (P.O.S.)—or Quick Change Gear Drive. Each drive is custom-built to your particular machine. This is accomplished by the Arc Welded Steel Bracket Construction.

Get greater production with a Berkeley Drive attachment.

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CORY PENNSYLVANIA

Libert *Hi-Speed* SHEAR



**CUTS
edges
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smooth,
to save
finishing time**

Run your finger over a Libert-sheared metal edge. It's SMOOTH—requires little or no finishing.

Saving Finishing Time is only ONE of many Libert advantages that help you to faster production, lower costs in sheet metal work. Write for the whole story!

Model 1036

36" Throat

Capacity—10 gauge mild steel

LIBERT MACHINE CO.

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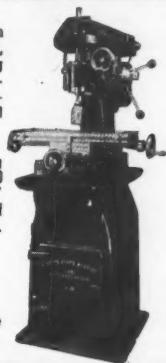
Vertical Mill and Jig Borer

A simplified, precision tool for milling, boring, facing and routing small parts for instruments, arms and munitions in tool, die and machine shops.

Spindle dia. at driving end, $\frac{1}{2}$ " 1150 and 1750 r.p.m., 5 speeds. 12" longitudinal travel of table, 7" cross travel. 4" spindle feed.

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Combines Production Speed, Power, Capacity, Fine Finish, and Accuracy. Simplified controls enable inexperienced operators to produce precision work fast.

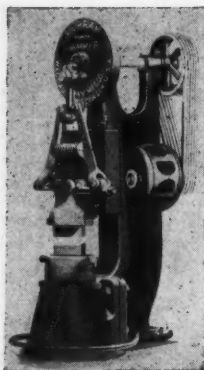
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**Murray Power-Driven
Forge Hammer with
250-Lb. Ram**

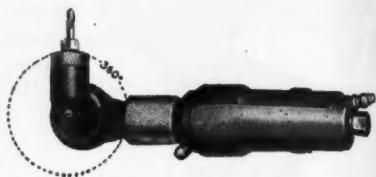
the D. J. Murray Mfg. Co., Wausau, Wis. The unit is made in five sizes with 25 to 500-lb. ram, and is said to be ideal for maintenance or production work.

Designed for easy and accurate control, the Murray Power-Driven Forge Hammer can be operated either mechanically or electrically, and is adjustable for accommodating different thicknesses of dies and materials. The ram of the unit is free from any obstruction, thus assuring operator full vision of work.

Cleco Multiple-Angle Drill

The Cleveland Pneumatic Tool Co., Marble Ave. and E. 77th St., Cleveland,

Ohio, is now producing a lightweight multiple-angle drill of the type shown herewith. Available in two models designated as the 9D010 and 9D020, the Cleco Multiple-Angle Drill features a drilling head which can be set at any



Cleco Multiple-Angle Drill

angle through 360 deg. and can be swiveled in two planes. The design enables the fingers of the operator's hand to be located close to the point of application, thus increasing the accuracy of handling the drill and ensuring speed in changing from one position to another.

The Cleco Multiple-Angle Drill weighs 2½ lb. and is approximately 8 inches long when set for drilling in a direction parallel to the center line. The chuck of the unit is designed to accommodate a ¼-inch drill. The speed of the No.

DIAMONDS FOR VICTORY TO FIT YOUR NEEDS SET IN SPECIAL ALLOY



Tell us the machine you are using—the grit, size and speed of wheel, also kind of work being done.

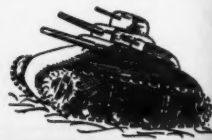
We will quote you on a truing tool that will give you results at the most reasonable cost.

Don't expect miracles—but you can expect service—based on experience—91 years of it! Send for data sheets and price list.



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Big demand for our products. State qualifications fully. All information in confidence. Write—Some territories still available.



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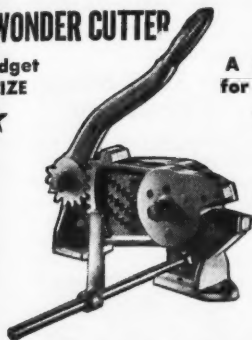
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A Midget
in SIZE



A GIANT
for WORK

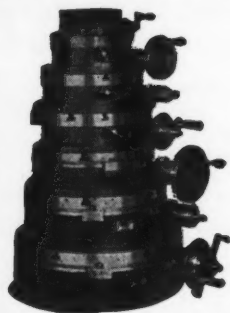


Cuts wire, rods or band iron easily and quickly. Any size wire or rod up to $\frac{3}{8}$ inch round or $\frac{3}{8}$ inch square and band iron up to $\frac{1}{2}$ by 2 inches. Its small size and low price makes it possible to have more than one, mounted wherever convenient. Gauge can be set for repeated cuts of same length on both wire or band iron. **FREE TRIAL** in your own shop. Write for further information and prices.

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Sizes 9", 12", 15", 18", 21", 25"

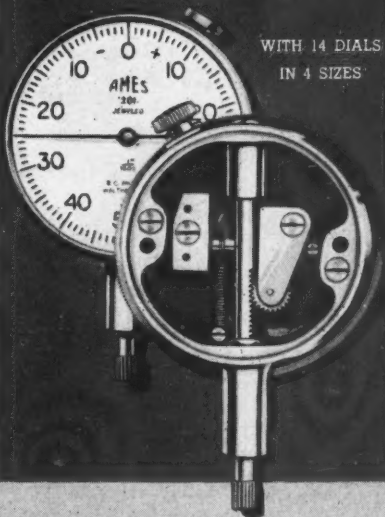
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AMES *Hundred Series* DIAL INDICATORS

WITH 14 DIALS
IN 4 SIZES



A COMPLETE NEW SERIES

These Dial Indicators have all the desirable features for measuring and checking accuracy. Four sizes to American Gage Design Committee specifications. Fourteen different dial numberings. One-piece, drop-forged cases and stems. Wire attached bezels. Cup-shaped dials that need no springs beneath. Pinions and shafts of hardened steel, ground for accurate fitting and long wear. Various styles of backs and contact points. The best and most effective shock-absorbing wheel assembly, optional.

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FASTER
Smoother
STRAIGHTER

CUTTING



These CATSKILL Abrasive Cut-Off Machines are cutting gear blanks, unannealed stock, tubing, extruded bars, cylinders, high carbon steel, pipe, etc.—without a secondary finishing operation. Solids to 2" and tubing and shapes to 3".

Cutting wheel runs in a slotted pipe through which coolant is pumped. This prevents surface hardening, burn and burr, and insures a smooth finished cut.

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CATSKILL METAL WORKS, Inc.

Manufacturing Engineers

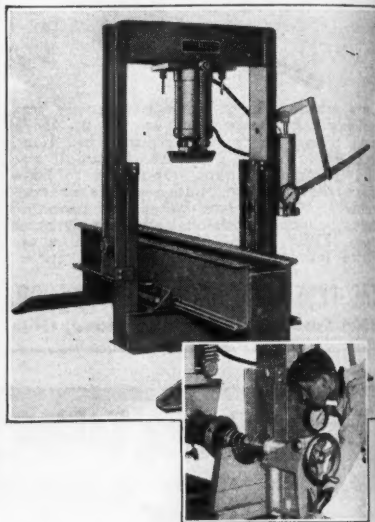
CATSKILL

NEW YORK

9D010 drill is 1,000 r.p.m. and that of the No. 9D020, 2,000 revolutions per minute.

Bee-Line Shaft Straightening Equipment

A line of equipment for straightening shafts or rear axle housings is now being manufactured by The Bee-Line Co., Davenport, Iowa. This equipment consists of one pair of work supporting



Bee-Line Shaft Straightening Equipment

center assemblies, two work supporting fixtures, one flat pressure and one round pressure tool, an assortment of half round spacers for shaft diameters up to 6½ inches, one surface plate, and a universal dial indicator for precision measuring.

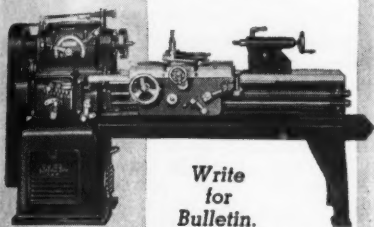
The center assemblies are of a heavy duty precision type with preloaded spring construction for supporting loads up to 1,000 lb. The centers deflect with the work during bending or pressing operations and return to the original gaging position when pressure is released. The centers are designed to accommodate work up to 8 feet long when used with a 10-foot press bed. The height above the bed is sufficient to enable work having an enlarged portion of 22 inches in diameter to be handled.

The two work supporting fixtures may

CARROLL AND JAMIESON LATHES 15" AND 16"

12 Speed Geared
Head Motor Drive
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Spindle.

Modern Design—
Liberal
Dimensions



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THE CARROLL & JAMIESON
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Why Use A Shaper to cut Keyways when a

DAVIS KEYSEATER

will do the
job so much
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JOIN THE **SAVE YOUR TAPS** MOVEMENT

THEY'RE NEEDED TO HELP BUILD MORE PLANES TO WIN THE WAR



ALCO
TAP HOLDER

Causes of tap breakage, well known to those familiar with drill and tap operations, may be improper feed or tap angles, incorrect alignment of work spindle, turret hole, tap bushing or holder.

ALCO TAP HOLDERS cannot correct improper feed angles nor misalignment of work spindle, but they CAN and DO afford exact tap angle, absolute concentricity on every tapping operation, and they very definitely eliminate the use of bushings. Use the tap holder that stops tap breakage and gives longer life to your taps.

ORDER ALCO TAP HOLDERS NOW

One of the family of Alco tool holders for every drilling, tapping, reaming and thread cutting operation.

ALCO TOOLS

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THE ALCO TOOL COMPANY

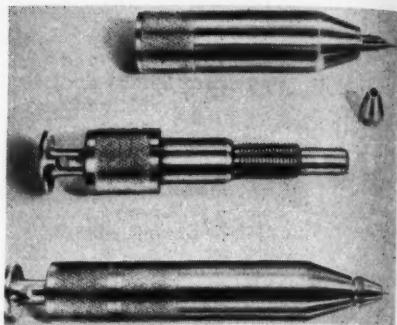
835 HOUSATONIC AVE. BRIDGEPORT CONN.
DETROIT OFFICE. — 908 STEPHENSON BLDG.

be spaced on the press according to the length of bend required in the work. For flat surface work, flat top supports are used. For round work, half round type supports are employed which have a maximum capacity of $6\frac{1}{4}$ inches diameter. For smaller work, half round spacers are employed until an approximate oversize fit is obtained. In this manner, pressure is said to be more evenly distributed over the round surface and the centers of the work maintained at the correct height for best operation. The half round pressure tool, which is connected to the press ram, is used in the same manner except that the half round spacers are placed on top of the work.

The surface plate is used as a sliding base for the dial indicator while gaging the trueness of the work, which is revolved on the centers to obtain a total run-out reading.

Aero Tool Precision Plomb Bob

Particularly adaptable to jig installations for the manufacture of armaments as well as other installations where precision aligning is necessary, the precision plomb bob shown here has

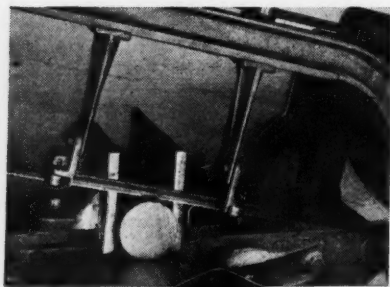


Aero Tool Precision Plomb Bob

been announced by the Aero Tool Co., 231 W. Olive Ave., Burbank, California.

A feature of the plomb bob is the indicating point, which consists of a phonograph needle, thus assuring a true and constantly sharp point at a practically nil replacement cost. The needle is held in place by a watchmaker's pin chuck. The hole for the suspension wire is held to exact size and is accurately centered with the indicating point.

The upper part of the bob is threaded



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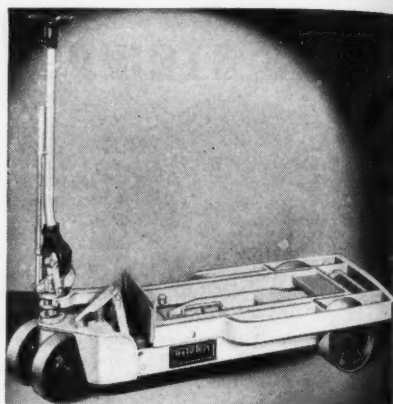
NEW YORK, N. Y.

into the lower part. Three bearing surfaces between these parts hold the parts absolutely concentric. Thus, by simply rotating one part upon the other, the indicating point of the bob can be raised or lowered over $\frac{1}{2}$ inch without losing concentricity. This adjustment feature is said to be particularly useful in the aligning of gun sights and other armament installations.

West Bend Model L "Weld-Bilt" Heavy Duty Hydraulic Lift Truck

West Bend Equipment Corp., West Bend, Wis., announces the addition of a 10,000-lb. capacity truck, designated as the Model L, to its line of "Weld-Bilt" hydraulic lift trucks. Designed for easy mobility and unusual efficiency in handling extremely heavy loads, this model is said to have all the standard "Weld-Bilt" features, including a shockproof horizontally mounted hydraulic unit, which is interchangeable and can be easily removed without special tools, thus permitting easy replacement after years of service.

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West Bend Model L "Weld-Bilt" Heavy Duty Hydraulic Lift Truck

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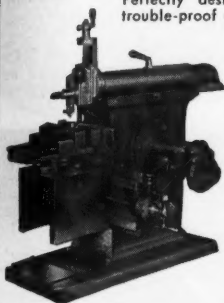
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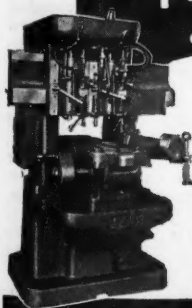
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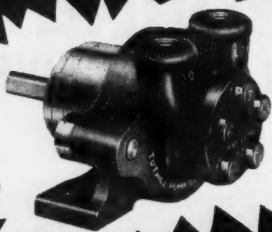
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The West Bend Model L Weld-Built Heavy Duty Hydraulic Lift Truck is available in a wide variety of sizes, heights, and widths.

Hygrade Sylvania P-7 Fluorescent Extension Cord Light

Designed in answer to a request for a small, cool light for close work and inspection in the restricted areas of



Hygrade Sylvania P-7 Fluorescent Extension Cord Light

bomber wings, a fluorescent extension cord light designated as the P-7 is now being marketed by the Hygrade Sylvania Corp., Lighting Division, Ipswich, Mass. The unit is of rugged, lightweight, and compact design and is said to be readily adaptable to all types of extension cord service.

Outstanding features of the Hygrade Sylvania P-7 Light are cool light source, easy lamp replacement, low wattage, and low brightness. The latter feature is said to be particularly desirable not only for reducing eye fatigue resulting from glare to a minimum but also for greatly increasing the effective illumination on work. An added feature of the light is a grille sturdily constructed of heavy gauge steel.

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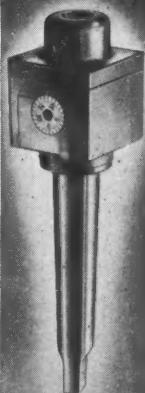
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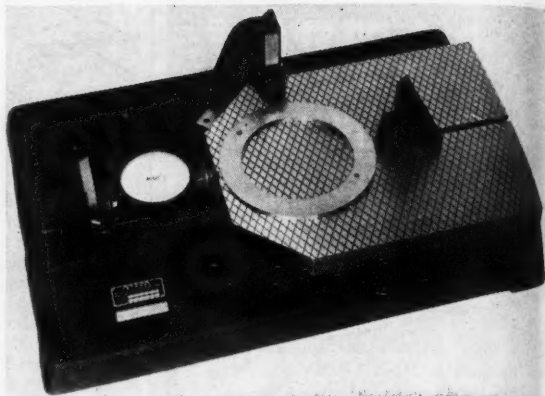
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**Federal Model 247 B-63
Diameter and Roundness
Gage**



Extension Cord Light is designed for operation on 110-125 volts, 60 cycle alternating current. The unit is $9\frac{1}{4}$ inches long overall, 1 inch wide overall, $1\frac{1}{4}$ inches high overall, and has an average weight of $2\frac{1}{2}$ lb. The lamp is finished with Miracoat baked enamel. The light is furnished complete with ballast operating equipment and 12 feet of cord.

**Federal Models 247 B-63 and
247 B-69 Diameter and
Roundness Gages**

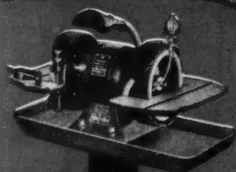
Designated as the Models 247 B-63 and 247 B-69, two gages designed for in-

specting diameter and roundness of workpieces have been placed on the market by Federal Products Corp., 1144 Eddy St., Providence, Rhode Island.

The Model 247 B-63 gage has a capacity for inspecting work from 6 to 12 inches in diameter and from $\frac{1}{4}$ to 2 inches thick, but can be easily modified to inspect smaller or larger work. The indicator of the gage is a Federal Super-sensitive type and is provided

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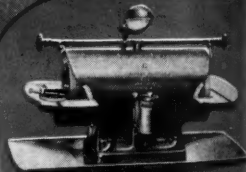
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Moving
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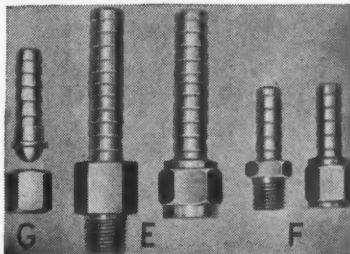
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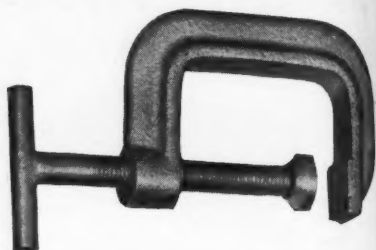
with a fine adjustment longitudinally. The indicator is graduated in ten-thousandths of an inch and has a range of 0.010 inch. The platen of the gage is ground and lapped, and both stops, as well as indicator, are adjustable both horizontally and vertically.

The Model 247 B-69 gage is particularly designed for checking the concentricity of spinning rings of from 1 to 7 inches in diameter. It can also be modified for checking larger or smaller diameters. After the two hardened steel-faced guides of the gage are set in correct position, the workpiece is rotated in contact with the guides, thus both diameter and roundness can be checked simultaneously. The indicator does not make direct contact with the ring but rather through a floating pantograph unit, which is said to increase the sensitivity of the gage and protect the indicator spindle. The indicator is graduated in thousandths of an inch.

Patterson-Ballagh Heavy Duty Non-Skid C-Clamp

A heavy duty type C-clamp having non-skid feature to prevent slippage on

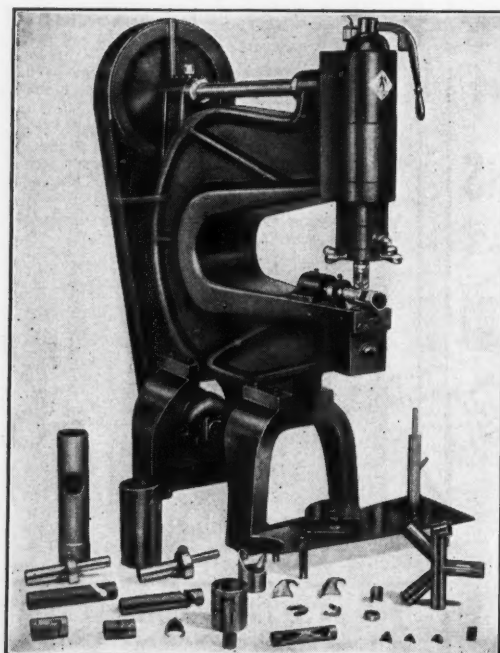
work when tightening has been placed on the market by the Patterson-Ballagh Corp., 1900 E. 65th St., Los Angeles, Cal. The screw, which is made of heat-treated steel, is provided at the clamping tip with a bronze bushing which is



Patterson-Ballagh Heavy Duty Non-Skid C-Clamp

designed to prevent galling and provide free movement so that slippage on work is eliminated.

The frame of the clamp is made of cast steel. The frame can also be made with terminal lug for use on grounding cable during arc welding. A welded T-



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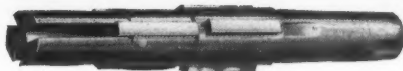
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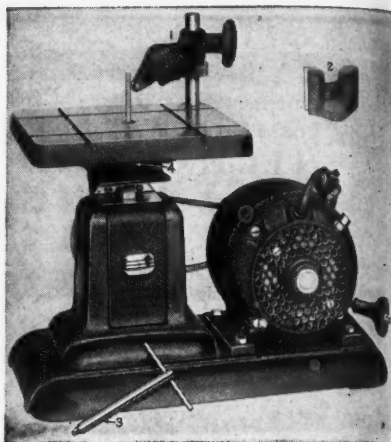
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shaped wrench handle designed to provide a firm grip for tightening clamp completes the design of the tool.

Industrial All American Filing Machine

Designed for use in performing unusually quick and accurate filing operations, the Industrial All American Filing Machine shown herewith is now being marketed by the Industrial Engineering Co., Inc., 141 W. Jackson Blvd., Chicago, Ill.



Industrial All American Filing Machine

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PLAIN OR SWIVEL
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Swivels 180°
either in a
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The precision ground table is set horizontally by a hardened and ground register pin operating through a hardened and lapped bushing at the rear of the table.

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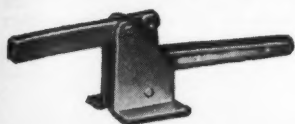
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GROBET FILE CO. of AMERICA

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DROP FORGED CLAMPS



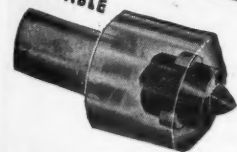
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All diamond sizes 1/4 to 10 karat are nib mounted for immediate shipment... Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, \$1.00 post paid.) Grinders instruction card free.

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19647 JOHN R ST.

DETROIT, MICH.

The table may be tilted by removing register pin, loosening clamp knob, and then setting table at desired angle.

Specifications of the Industrial All American Filing Machine are as follows: stroke, $\frac{3}{4}$ inch; height, $9\frac{1}{2}$ inches; speed, 625 strokes per minute with 60 cycle motor, 540 strokes per minute with 25 cycle motor; table, $8\frac{1}{4}$ x $8\frac{1}{4}$ inches, tiltable in two directions; file clamp capacity, $\frac{1}{2}$ to $\frac{3}{4}$ -inch diameter file shanks; motor, $\frac{1}{4}$ h.p., 110-volt, 1,725 r.p.m.; a.c.; net weight, 45 pounds.

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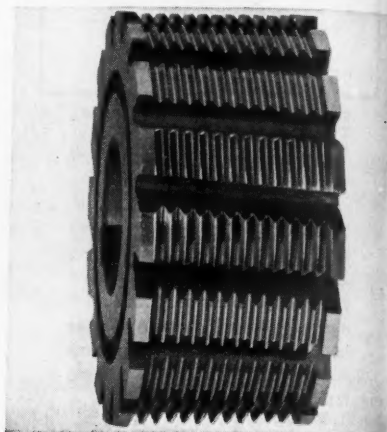
BEVERLY SHEAR CO.

3004 W. 111th St.

Chicago, Ill.

Detroit Thread Milling Cutter

A buttress thread milling cutter designed to automatically relieve the ends of threads by removing the feather edge



Detroit Thread Milling Cutter

at the end of each thread as it is milled is now being marketed by the Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich. The cutter is available in three basic styles—one for use in relieving one end of a thread only, another for relieving both ends of a thread, and a third without plain cutting portions (no thread relief). The accompanying illustration shows a style of cutter designed to remove the feather edge at both ends of a thread.

The Detroit Thread Milling Cutter can be supplied in any style to suit standard thread milling machines and in both

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when Whitney Milling Cutters
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Complete information
in Catalog V-111. Write.

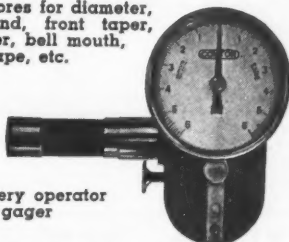
The Whitney Chain & Mfg. Co.
HARTFORD, CONNECTICUT

Automatic gaging accuracy to fractions of .0001" COMTORPLUG

Checks bores for diameter,
out-of-round, front taper,
back taper, bell mouth,
barrel shape, etc.

Sizes:
1/4" to 7"
dia. and
larger

Makes every operator
an expert gager



This unique patented expanding internal
gage is found on machines and inspection
tables in the airplane, ordnance, automo-
tive, electrical and other industries where
high precision of bores is required. Shows
ACTUAL SIZE of hole, and reveals irregu-
larities such as out-of-round, tapers, etc.
Automatic 2-point gaging, equally precise
in untrained or expert hands.

Request Bulletin 27

THE COMTOR CO.
64 Rumford Ave. Waltham, Mass.

QUADRO *Precision* LIVE CENTERS

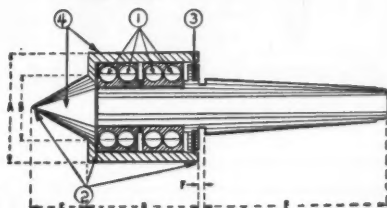
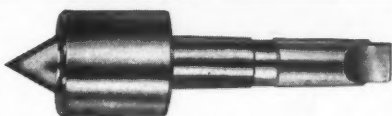
FEATURES...

1. FOUR ROWS of precision BEC-4
specification bearings.
2. SHORT OVERHANG assures rigidity
and accuracy — eliminates "chatter."
3. Positive FELT-SEAL excludes dirt and
retains lubrication.
4. HARDENED AND GROUND CONE.
Point accurate to within .0002".
5. Heavy duty—Note Combined Radial
Thrust Load at 100 R.P.M.

All orders must be accompanied by
extendable priorities. Write today!

FISHER TOOL CO.

226 LAFAYETTE ST. NEW YORK, N. Y.



DIMENSIONS

Model Taper No.	A	B	C	D	E	Combined Radial-Thrust Load At 100 R.P.M.	Net Price
2	1 1/4"	1"	3/4"	1 1/4"	2 1/2"	1600	\$23.00
3	1 1/4"	1"	3/4"	1 1/4"	3 1/2"	3300	\$25.00
4	2 1/2"	1 1/2"	1 1/4"	1 1/4"	4 1/2"	7500	\$35.00
5	2 1/2"	1 1/2"	1"	2 1/4"	5 1/2"	12000	\$47.00

spiral and straight gash types. The cutter is said to be widely used for both external and internal milling of threads on such parts as cylinder heads, propeller hubs, and so on. It is available in both shell and shank types with threads as well as plain cutting portions ground from the solid.

Lyon Tool Stands

A line of tool stands especially designed for the efficient individual storage of tools of workers on one, two, and

three-shift operations is now being introduced by Lyon Metal Products, Inc., Aurora, Ill. The stands are said to be useful around production machines,



Lyon Tool Stands

toolrooms, assembly lines, and as part and tool transporters for maintenance men, equipment carriers for inspectors, and so on.

Drawers of the units feature easy sliding and are equipped with flat key locks to guard against possible theft of important tools.

"Saftoid" Feed Wheel

As a substitute for hard rubber feed wheels used in centerless grinding ma-

U. S. HEADS

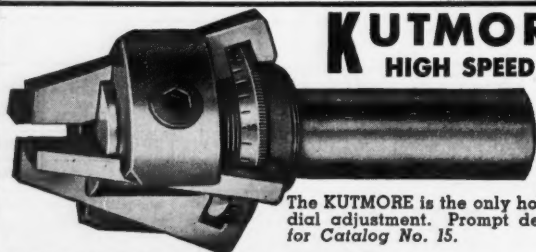
STANDARD SINCE 1915



Two Spindle Head
Both Spindles
Adjustable

The United States Drill Head Co.

1954 Riverside Drive
CINCINNATI, OHIO



KUTMORE ADJUSTABLE HIGH SPEED HOLLOW MILLS

16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery—even on specials. Write for Catalog No. 15.

CARL WIRTH & SON, 1625 Clinton Ave., N.

Rochester, N. Y.

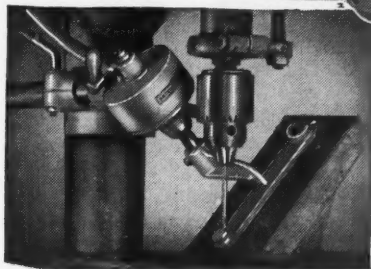
NEW MEAD AIR-CLAMP

Wherever a drill comes down, something must hold the work. Wherever a drilling-jig is required, Air-Clamp will simplify it. Wherever speed is desired, Air-Clamp will produce it. Air-Clamp holds with relentless pressure; it is undisturbed by size variations (such as in castings), it scoffs at vibration (how many drills have been broken due to faulty holddowns?), chatter, snagging. Air-Clamp holds work of any size or shape in any position, at any angle. It can pay for itself on a single fixture; it can save its cost on a few days' drill-press output. It reduces operator fatigue. It saves hours and dollars in drafting-room, jig department, tool room and production line. Air-Clamp fits any drill-press having a cylindrical column. Special fixtures for Tee-slotted tables, light milling work, etc. Hand and/or foot control. Shipped on approval to responsible concerns.

Foot Air Control Ready!



For air-operated devices. Frees hands, speeds work.



FOR
GREATER
DRILL
PRESS
OUTPUT

PROMPT
SHIPMENT

Write for details.

Mead Specialties Co.

15 S. MARKET ST.

Dept. 8-AA

CHICAGO

INSPECT SMALL PARTS Quickly and Accurately with MAGNI-RAY

The MAGNI-RAY gives an unusually wide field of view and has a magnification power of 3 plus. You do not have to bring the eye close to the lens to see the full field.

Universal clamping attachment allows turning to any angle. May be held in hand or attached to a machine tool. The MAGNI-RAY aids accuracy and saves time and material by detecting imperfections in small parts not apparent to the unaided eye.

TEN DAYS FREE TRIAL — WRITE TODAY!

Model A complete with 3" lens.....\$18.50

Model B complete with 2" lens.....\$27.50
Less 10%.

Priorities Required. Send with Purchase Order.

GEORGE SCHERR CO., INC.

130 LAFAYETTE ST.

NEW YORK, N. Y.



Delivered ready to plug into your standard 110 volt lighting circuit.

chines, The Safety Grinding Wheel & Machine Co., Springfield, Ohio, is now marketing a feed wheel made of a



"Saftoid" Feed Wheel

material known as "Saftoid." Wheels of this type in addition to conserving rubber are said to have an unusually long life.

Keep 'em Turning **Flexoid** INDUSTRIAL *Couplings*



Write for
complete information.

WITH the THERMOID
HARDY Flexible discs
that aid in eliminating
wear and tear on the
driving units.

DEALERS IN PRINCIPAL
CITIES CARRY
STOCKS FOR IMMEDIATE
SHIPMENT.

FLEXOID COUPLING CO., Div.
THE SMITH POWER TRANSMISSION CO.
1545 E. 23rd Street Cleveland, Ohio

Olive Drab Color for Carbozite Coatings

Carbozite Corp., First National Bank Bldg., Pittsburgh, Pa., announces that its standard, shop, and textile coatings are now available in a government-approved olive drab color.

Carbozite Standard Coating, which is used for protecting roofing, siding, piping, machinery, and all exposed steel work, is said to resist the corrosion of acid, alkali, moisture, sulphur water, salt air or water, smoke, and so on. It is available in carbozite black, red oxide, green, noncorrosive light and dark gray, and the new olive drab in consistencies for brushing, spraying, or dipping.

Carbozite Shop Coating, a material for shop prime-coats or product protection during shipping or storage, is a quick-drying coating which can be sprayed, brushed, or dipped and is designed to protect steel, nonferrous metals, and so on, from moisture, fumes, salt air or water for long periods of exposure. According to the manufacturer, this coating is being extensively used as a primer for structural steel in the shop and for protection of bright products being shipped in open cars and overseas.



Model U-7
A 60,000
R.P.M. Unit

DESIGNED for real production work and the toughest jobs. A powerful, high-speed tool, widely used and recommended.—A worthy companion to our famous "SUPER SPEED" MODEL S.S.-S.R. Precision made, streamlined, excellent balance. Special grease-sealed bearings—no lubrication required. Also Other Models and Air Line Filters and Automatic Air Line Lubricators.

A FAST-
CUTTING
STURDY
TOOL

Write for
Circular and Details
of FREE
TRIAL
OFFER

M-B PRODUCTS • EXPORT OFFICE
44 WHITEHALL ST.
130 E. LARNED ST., DETROIT, MICH. New York, N.Y.

Production STEP UP

WITH GROB DIE MAKING MACHINES

"THE TOOLMAKER'S BEST FRIEND"



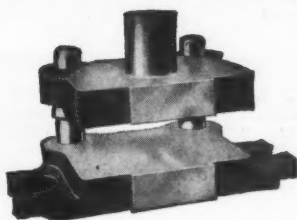
Unmatchable performance for most difficult sawing and filing of tools and dies. Compact, powerfully built, for rigorous shop service. Faster, more economical in operation.

Write or wire for details and prices.



PRODUCTO

DIE SETS



Master Die Sets

are made for the finest and most accurate die work. Steel pins and bushings are hardened, ground and lapped to very close limits. Working surfaces of punch and die holder are ground parallel to close limits.

Standard Die Sets

are made for ordinary die work. Fitted with hardened and ground steel pins and bushings, or with hardened and ground steel pins and cast bushings.

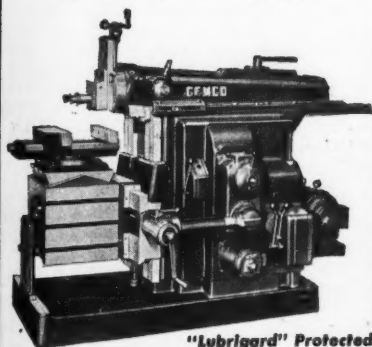
You can order both types from stock at 3 warehouses.

Write for detailed 96 page catalog.

GEMCO MULTI-PURPOSE SHAPERS

EMBODY

COMPLETE SAFETY



"Lubrigard" Protected

PLAIN • PRODUCTION • UNIVERSAL TYPE

Write

General Engineering & Mfg. Co.
St. Louis Missouri

THE PRODUCTO MACHINE CO.



990 HOUSATONIC AVE.
BRIDGEPORT, CONN.
3017 MEDBURY AVE.
DETROIT, MICHIGAN
DIE SUPPLY CO.
1390 E. 30th ST.
CLEVELAND, OHIO

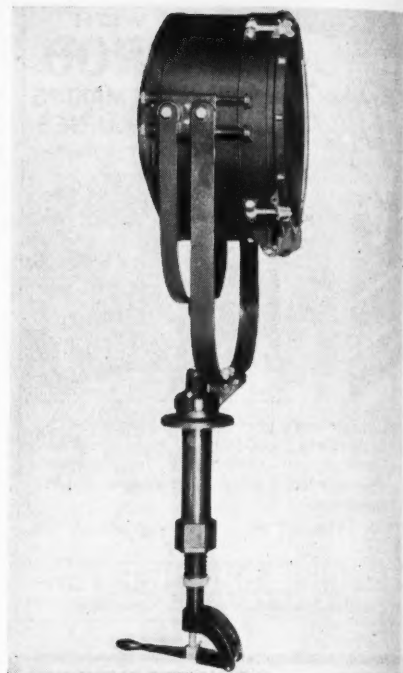
Manufacturers and distributors of Die Makers' Accessories, Machine Vises, Dickerman Automatic Press Feeds.

Carbozite Textile Coating is designed for use in waterproofing fabrics, tarpaulins, and so on.

Westinghouse 18-Inch Searchlight

Designed for use around industrial plants, ordnance plants, aboard ships, and so on, an 18-inch incandescent searchlight with pilot house control or flat base is announced by the Westinghouse Lighting Division, Cleveland, Ohio.

Intense beam concentration is obtained by means of a primary precision



Westinghouse 18-Inch Searchlight

ground and polished silvered-glass reflector and a metal secondary reflector designed to permit continuous operation with lamps up to and including 1,500 watts. A tandem reflector shield mounted in the center of the primary reflector is said to eliminate all secondary heat concentration on the lamp bulb. Heat dissipation is by radiation, thus permitting the use of a dust-tight enclosure.



CONTINUOUS HINGES

Manufactured by

**AUTO MOULDING
& MFG. CO.**

2326 S. CANAL ST.

CHICAGO

WRITE FOR STOCK LIST



Increase Production With

CURVE TOOTH CUTTERS

Woodruff Keyway, Plain Milling

Enjoy the Advantages:

More cutting edge	Gives shearing cut
Cuts 50% faster	Easy to sharpen
More cuts per sharpening	

Write for Details.

ABER ENGINEERING WORKS, INC., Waterford, Wis.

**you can get the
work-benches you need
... easily ... economically**

Choose from 1367 "HALLOWELL" Work Bench Combinations. Easy to set up ... easy to move, if necessary. Strong as a rock and rigid—without costly bolting to floor.

HALLOWELL

SHOP EQUIPMENT

"HALLOWELL" Work Benches have tops of smooth, high grade laminated wood, Masonite, or if advantageous of steel. Welded angle legs in five different heights and width for your selection. **STOOLS** in styles to meet every possible requirement.

WRITE FOR CATALOG.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 556

— BRANCHES —

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

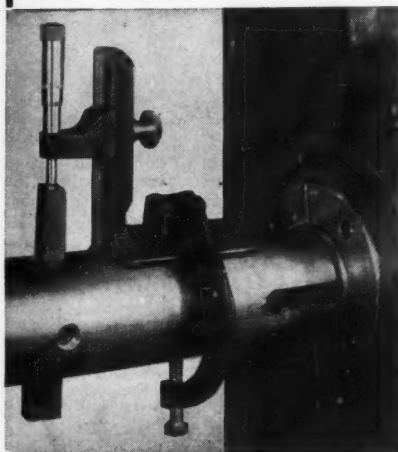


***Fig. 732**
With steel top.
Drawer is extra.



Fig. 1334
*Pat'd and Pat's Pending

FOR SPEEDY, ACCURATE SETTING OF BORING TOOLS



**SPEED and ACCURACY
essentials in
WAR PRODUCTION SHOPS**

Clamp the Tool Setting Gauge to the boring bar. Use the slide to bring micrometer to top of cutter. Back off micrometer to number of thousandths required to bore to size, adjust cutter to micrometer and fasten it, remove gauge and go to work.

The gauge may be had with either a micrometer or dial indicator.

BARTELT ENGINEERING COMPANY

1214 PARTRIDGE AVENUE

BELOIT, WISCONSIN

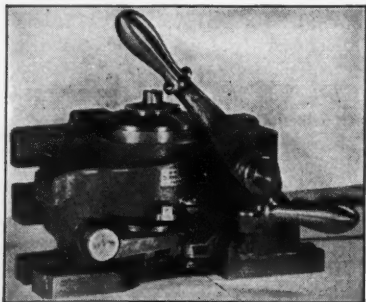
The body and back sections of the housing are of sheet steel. The door and door frame are of cast iron with integrally cast hinge and lathe lugs. The door is clamped in position against a weather-tight heat-resisting gasket or graphited asbestos.

The lens is of heat and impact-resisting polished glass mounted against a weather-tight gasket and held in position by steel spring clips. The primary reflector is a 19-inch parabolic commercial-precision mirror coated with silver and sealed by an electrolytic coating of copper and synthetic material. The

secondary reflector consists of polished metal, designed to provide high reflectivity.

The body is supported in a steel bow with locking handles to position the luminaire at any fixed elevation and rotation. The socket assembly is a standard mogul bipost-type rated at 50 amperes, 600 volts. The socket assembly is normally fixed in position but is independently adjustable for elevation and rotation.

All castings and sheet parts of the Westinghouse 18-Inch Searchlight are finished with one coat of red lead oxide and two coats of weatherproof green paint. Hardware is galvanized or plated.



DEARBORN Automatic Chucking and Indexing Fixture MILLS OVER 1000 PARTS PER HOUR

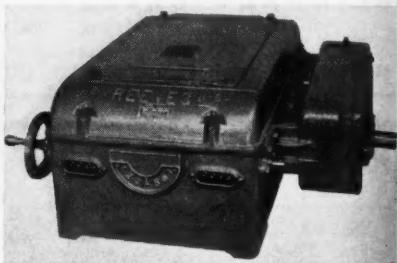
Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN

70 S. CLIFF ST. • ANSONIA, CONN.

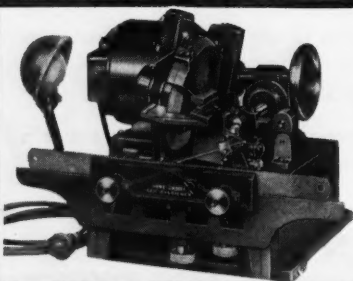
Reeves Variable Speed Transmission with Built-In Chain Drive Reducer

Reeves Pulley Co., Dept. MS, Columbus, Ind., is now offering a variable



Reeves Variable Speed Transmission with Built-In Chain Drive Reducer

speed transmission of enclosed design with built-in chain drive reducer, the chain drive operating in a bath of oil.

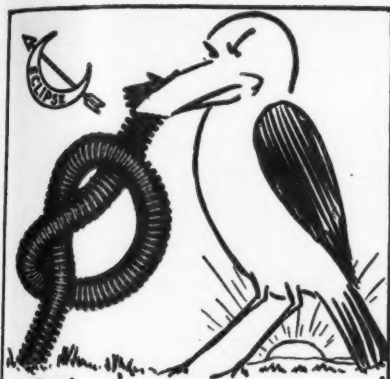


FOR QUICKLY RECONDITIONING HACK, BAND, CIRCULAR AND SLITTING SAWS

The compact Howe-Lindsey Automatic Saw Sharpener operates at a speed of 83 teeth a minute—on any size hack or band saws: circular saws up to 20" in diameter; metal slitting saws and milling cutters up to 5/16" face.

WRITE FOR FOLDER.

HOWE & SON, Inc. • Hinsdale, N. H.



It's a tough worm
says this bird.

"It twists and it bends, While I pull and I shake,
And give it the works, But still it won't break."

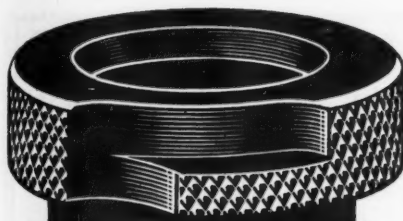
Write for Free Bulletin No. H-201.

ECLIPSE AVIATION

Seamless Flexible Metal Hose

Manufactured and Sold By

Division of Bendix Aviation Corporation
DEPT. No. 2 PHILADELPHIA, PA.



QUICK DELIVERY

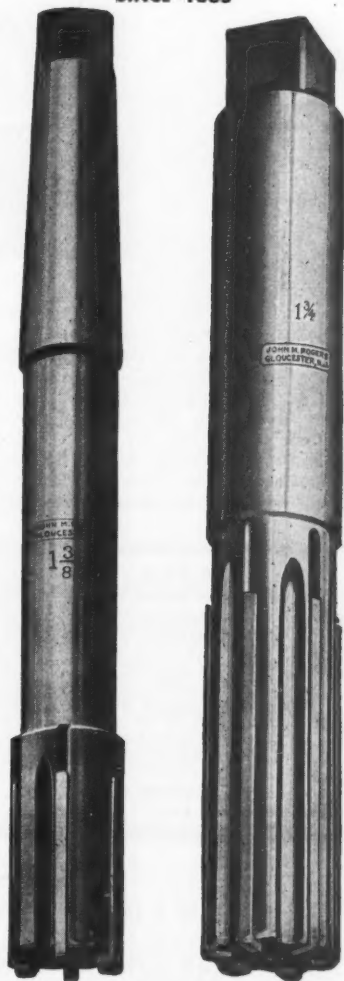
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Sheets and Prices . . .

COLONIAL BUSHINGS, Inc.
145 Jos. Campau St., Detroit

COLONIAL
DRILL JIG BUSHINGS

ROGERS REAMERS

SINCE 1885



Conserve High Speed Steel by using
Rogers inserted Blade adjustable-for-
wear Reamers.

JOHN M. ROGERS TOOL CORP.
GLOUCESTER CITY NEW JERSEY

Clark Electric Tractor

The output shaft of the transmission is located in exact alignment with the input shaft. Output speeds may be increased or decreased as compared to the variable speed shaft of the transmission by turning a handwheel.



Clark Electric Tractor

Designed for use in handling materials, parts, and finished products around factories, warehouses, and so on, the Clark Electric Tractor shown herewith has been introduced by the Clark Tractor Div. of Clark Equipment Co., Battle Creek, Mich. The machine is designed to lift from 2,000 to 7,000 lb., using a hydraulic vane type

pump driven by a special series wound motor. The same pump operates a tilting unit which enables the operator to tilt the load back 10 deg. for safe riding and tilt it forward for tiering.

The machine has four speeds forward and four speeds in reverse, with speeds up to 6 m.p.h. under full load, 7.5 m.p.h. empty. The truck is designed to climb $7\frac{1}{2}$ per cent grades under maximum load. Drive is on the front wheels, with rear wheel steer. The driving axle

SAVES YOU

TIME — MONEY — SPACE

Saves time because all stock is in view. No looking around. Saves money because original cost is low. Saves space because very little required. 4 arm, 51" high, stacks 10,000 lbs. flat or round stock; 5 arms, 57" high, 12,000 lbs. Tubing less weight—3 stands for 20' lengths or 2 for 12' or shorter. Use against wall or back to back in center of room. Small cost—big value.

Priority Regulations govern delivery.

WM. S. YOHE SUPPLY CO.

505 Gibbs Ave. N. E., Canton, O.

T. H. LEWTHWAITE MACHINE CO.

PUNCHES CUTTERS
BENDERS
SPECIAL TOOLS

PUNCHES and DIES for round, square and other shaped holes.

317 EAST 47TH ST. • NEW YORK CITY
Wickersham 2-7164



EVANS HIGH SPEED STEEL REAMERS



LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

**WILL SHIP ON
30 DAYS' TRIAL**

EVANS FLEXIBLE REAMER CORP.
4541 RAVENSWOOD AVE. • CHICAGO, ILL.

**WRITE FOR
CIRCULAR**

Gear Specialties

SPURS — HELICALS (14 to 96 D.P.)

BEVELS — (straight and spiral)

WORM GEARING — THREAD GRINDING

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full production capacity scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every urgent need will be given careful consideration.

Gear Specialties

MANUFACTURERS

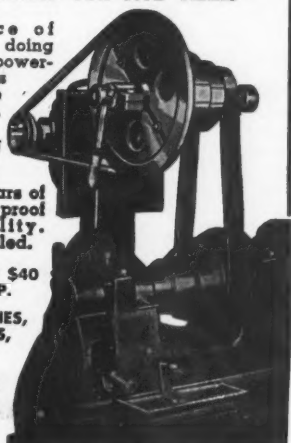


CHICAGO



STEEGE MOTOR DRIVES FOR DEFENSE GUARANTEED FOR FIVE YEARS

No chance of breakdown, doing a good job powering machines for defense production. No noise, floating cone, results 100% power. 8 years of production proof of durability. Easily installed.



**PRICED AT \$40
AND UP.**

**FOR LATHES,
SHAPERS,
MILLERS,
ETC.
IMMEDIATE
DELIVERY.**

Send for descriptive pamphlet.

W. L. STEEGE MACHINERY CO.
102 JEFFERSON ST. CHICAGO, ILL.



**ETTCO-EMRICK
TAP CHUCKS**

5 sizes for No. 0 to 1" taps. Visible grip feature assures proper insertion of taps. Details in Bulletin No. 6. Collet type chucks also available.

MAKE DOUBLE-DUTY MACHINES OF YOUR DRILL PRESSES

with *Ettco-Emrick*

TAPPING ATTACHMENTS

Clamp one of these attachments to the spindle of a drill press and presto — you have a high-speed, sensitive drilling machine. Takes only a few minutes and requires no alterations to the press. **QUILL CLAMPS** are available for rigid mounting on any press.

BULLETIN No. 2 will give you full details. We'll mail you a copy promptly on request.

ETTCO TOOL CO., Inc.

598 Johnson Ave., Brooklyn, N. Y.

Detroit

Chicago

MAKERS

OF *Ettco-Emrick* DRILL CHUCKS • TAP CHUCKS • TAPPING ATTACHMENTS
MULTIPLE TAPPING AND DRILLING HEADS • TAPPING MACHINES

is of a Clark special double reduction gear and pinion type, mounted on ball and roller bearings. The General Electric driving motor is mounted directly on the axle and drives the axle through ring gear and pinion.

Standard equipment of the Clark Electric Tractor includes hydraulic brakes, centrally located control levers, spring mounted rubber cushioned seat, disc type wheels, and electric horn. The machine is available with Edison alkaline battery or any standard make of acid battery desired.

SAFETY

(Reg. Trade Mark)

HEAVY BEVEL LETTERS & FIGURES



- No Spalling
- No Mushrooming
- 50% to 100% more Servical

All Sizes ($\frac{1}{8}$ " to $\frac{1}{2}$ ") carried in stock.

Write for Prices and Circular

M. E. CUNNINGHAM CO.

158 E. Carson St.

Pittsburgh, Pa.

Flexrock "Instant-Use Resurfacer"

Designed to permit immediate travel after application, a material for patching or overlaying rutted floors, to be known as Flexrock "Instant-Use Resurfacer," has been placed on the market by the Flexrock Co., 2315 Manning St.,



Flexrock "Instant-Use Resurfacer" Being Applied to Floor

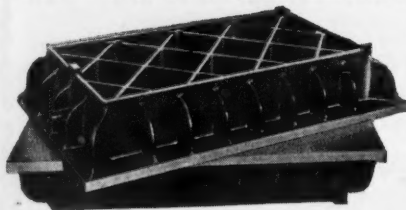
Philadelphia, Pa. The material is said to improve in smoothness and compactness under the wheels of constant traffic.

According to the manufacturer, Flexrock Instant-Use Resurfacer adheres to old concrete or wood and bonds to a feather-edge. Trucks which are used over a floor of this material are said to start easily after standing.

"Stadoil" Diamond Lapping Oil

Designed to eliminate the loading and glazing of diamond wheels and laps, a diamond lapping oil to be known as "Stadoil" is now being manufactured by the Stadoil Mfg. Co., 617 S. Beacon St., Dallas, Texas. A light green compound-

REID MASTER PLATES



A NECESSITY IN EVERY PLANT WHERE ACCURACY IS DESIRED

THOROUGHLY NORMALIZED and WEATHER SEASONED.

PLANED and SCRAPED on same 3-POINT BEARING on which they will rest in use. GUARANTEED ACCURACY within .0003" on a 24" x 36" size. PLANED and SCRAPED in sizes 12" x 18" to 36" x 72". THE ONLY PLATE that has a 50% trade in value when purchasing a new REID plate.

Prompt delivery on priority orders.

Tool Engineering Service Co., Inc.
241 Washington Ave. Nutley, N. J.

BAUMBACH



STANDARDIZED

DIE SETS

Machined Steel Semi-Steel

DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, a listing of more than 195,000 stock sizes and 46 different styles afford a service that is unsurpassed.

Send for Our New Catalog

E. A. BAUMBACH MFG. CO.

1806 S. Kilbourne Ave. Chicago, Ill.

Everyone Connected with Metal Cutting and Shaping Knows

*that correct and frequent
grinding of tools is
absolutely necessary*



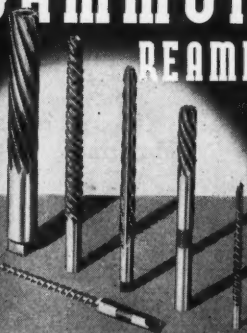
You would never allow a mechanic to use a dull broach or a dull drill. You require that all tools be sharp before using and be reground the moment dullness begins.

THIS NECESSARY PRACTICE HAS BEEN NEGLECTED IN REGARD TO POWER HACK SAW BLADES. THIS NEW METHOD OF GRINDING BLADES NOT ONLY INCREASES CUTTING EFFICIENCY BUT EFFECTS GREAT SAVING IN BLADES AS WELL.

Industrial Engineering Co., Inc.
141 W. Jackson Blvd.
CHICAGO ILLINOIS

GAMMONS

REAMERS



Manufacturers of

- The Gammons Helical Taper Pin Reamer
- The Gammons Helical Chucking Reamer
- The Gammons Helical Die Makers Reamer
- The Gammons Duplex Taper Pin Reamer

Special reaming problems invited

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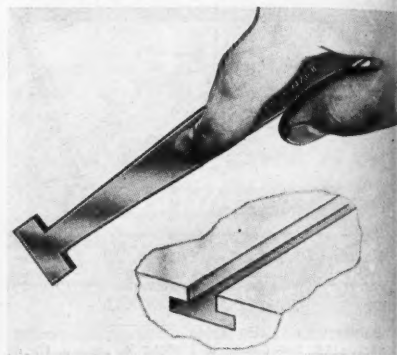
THE GAMMONS-HOAGLUND CO.
MANCHESTER CONNECTICUT

ed lubricant which, it is claimed, will not load or gum under any conditions, "Stadoll" is said to keep wheels or laps open for cutting without any tool pressure, thereby permitting an unusually fine degree of finish to be obtained and increasing wheel and lap production as well as wheel and lap life.

Dayton Rogers Machine Tool Slot Cleaner

The Dayton Rogers Mfg. Co., 2835 S. 12th Ave., Minneapolis, Minn., is now of-

fering for free distribution a handy tool for removing chips and other foreign matter from slots in the average planer milling machine and other machine tools. The tool has a small cleaner sec-



Dayton Rogers Machine Tool Slot Cleaner

tion at one end and a large cleaner section at the other, thus making it adaptable for use in both small and large slots.

The Dayton Rogers Machine Tool Slot Cleaner is made from 0.165-inch thick high quality flat steel, which is finished to prevent rusting. The tool is approximately 6 inches long and is provided with a hole for hanging. Tool will be sent free upon receipt of a request addressed on a company letterhead.

So-Lo Rubber Plastic Repairing Material

As a means for conserving rubber as well as maintaining production in plants producing war materials, the So-Lo



Winter

TAPS & DIES

Manufacturers of
Hand, Machine
Screw, Chip Driver,
Pipe, Nut, Stove
Bolt, Boiler, Pulley,
Staybolt, Tapper
Taps, Serial Sets,
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WILL EARN ITS COST IN ONE DAY
The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

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FOR QUICK, POSITIVE CLAMPING IN ANY

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STRAIGHT CLAMPING BAR

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50,000 CULLMAN Sprockets

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CULLMAN WHEEL CO.

1352-V ALTGELD ST., CHICAGO, ILL.

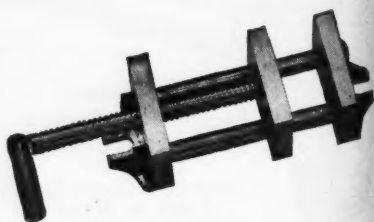
Works, Cincinnati, Ohio, is now marketing a rubber plastic material which can be readily applied to conveyor belts and other vital rubber products now in service for repairing holes and worn spots, thus eliminating the need for replacing such products and at the same time enabling plants to maintain constant production.

The material, a putty-like substance, is said to contain a very small proportion of crude rubber. According to the

manufacturer, an average repair made with the material on a conveyor belt or on protective clothing such as boots, gloves, and so on, contains less than one forty-eighth of an ounce of rubber.

Patterson-Ballagh All-Steel Drill Press Vise

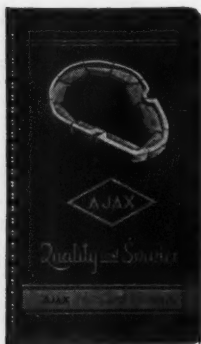
Illustrated herewith is an all-steel drill press vise which has been announced by the Patterson-Ballagh Corp., 1900 E. 65th St., Los Angeles, Cal. The



Patterson-Ballagh All-Steel Drill Press Vise

vise is provided with screw having square threads which operate against a bronze thrust bushing, and is designed so that work can be drilled completely through without injury to vise. In all three working positions, the vise is constructed to lie flat on faceplate.

Ideally adapted to small assembly work and for holding small pieces of machinery for filing, and so on, during bench operations, the Patterson-Ballagh Drill Press Vise is made in two sizes—one with 5½-inch opening and ears for fastening to faceplate and another with 3-inch opening without ears.



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— WITHOUT DIES!

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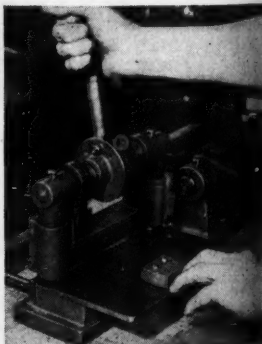
Photo (courtesy Minneapolis-Honeywell) shows Di-Acro Shear No. 1, which squares up stampings, cuts strips, makes slits or notches. All work accurate to .001".

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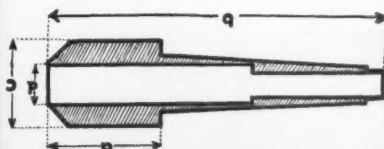
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END MILL ARBOR

S. & A. End Mill Arbors are made of steel, unhardened, carefully fitted, accurately sized and are well known for their durability.

No. of Arbor	Taper	A	B	C	D	Net Price Each
EA 10	MORSE No. 2	1 1/4"	4 1/2"	1-1/16"	3/8" & 1/2"	\$5.00
EA 11	MORSE No. 3	1 1/4"	4 1/2"	1 1/4"	3/8" & 1/2" & 5/8"	\$5.50
EA 12	BROWN and SHARP No. 7	1 1/2"	4 1/2"	1-1/16"	3/8" & 1/2"	\$5.00
EA 13	BROWN and SHARP No. 8	1 1/4"	5 1/2"	1 3/8"	3/8" & 1/2" & 5/8"	\$5.50
EA 14	BROWN and SHARP No. 10	1 1/4"	7 1/2"	1 1/4"	3/8" & 1/2" & 5/8"	\$6.00

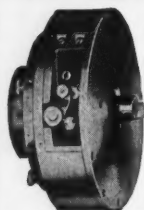


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109 EDISON PLACE NEWARK, N. J.

1942

August, 1942

MODERN MACHINE SHOP 325



M-D Facing Heads

With Automatic Feed

Can be attached to Boring Mill Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically. Sizes 6" to 46" diameter.

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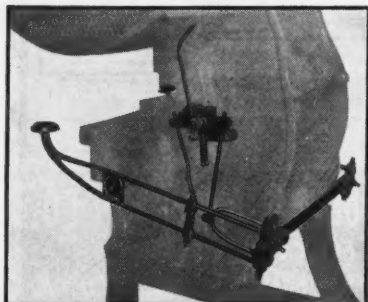
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Speeds layout on all metals. Gives clean accurate detail. Won't chip, crack or flake off. Comes 8 oz. brush-in bench cans, also pts., qts., gals.

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Sweep Guards... Single-Stroke Attachments
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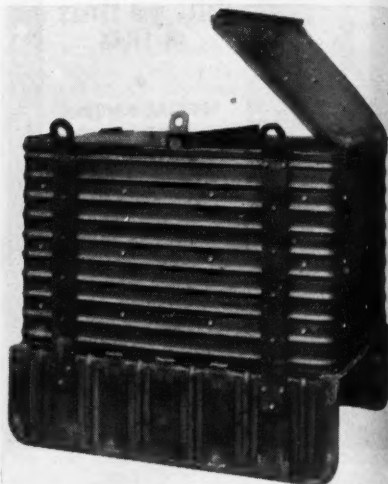
JOHN HUMM SAFETY EQUIPMENT CO.

251 SHEFFIELD AVE.

BROOKLYN, N. Y.

Union Insulated Skid Box

A special skid box for storing and cooling hot forgings has been developed by The Union Metal Mfg. Co., Canton, Ohio. The unit has a 7 gauge skid, 9 gauge outer casing, and 12 gauge in-



Union Insulated Skid Box

ner casing with $\frac{3}{4}$ -inch asbestos lining in between. The lid is also reinforced and insulated.

In use, the box is filled with hot forgings, picked up by a crane or lift truck, and then stored out of the way until the forgings have completely cooled. The use of the box is said to reduce flaking to a minimum and eliminate time spent in burying and uncovering forgings.

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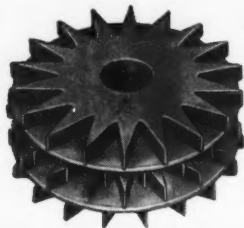
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SPUR PINIONS**

GEARS OF EVERY DESCRIPTION

THE GREAVES MACHINE TOOL CO.

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GRINDING WHEEL
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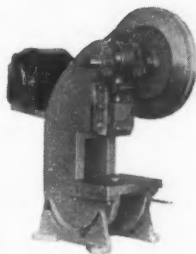
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BRONZE BEARINGS**

Built like the "big ones" are the mighty Duro Four Ton and One Ton Punch Presses.

Heavy bronze bearings, rugged frames, precision construction for high-speed production at low cost. Write today for illustrated catalog on Duro Punch Presses, Bench Milling Machines and Accessories.

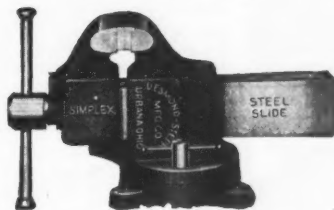


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**SIMPLEX
Steel Slide
VISES**



A full line of Machinists', Filers, Welders, Production and Drill Press and Milling Machine Vises. Let us send you our vise catalog and name of your nearest dealer.

The Union Insulated Skid Box can be supplied in sizes to meet individual requirements.

Eclipse Plastic Parts for Heavy Machine Tools

Various plastic parts for replacing items of critical material on heavy machine tools are now being produced by the Eclipse Moulded Products Co., Milwaukee, Wis. An application of such parts is shown in the accompanying illustration.

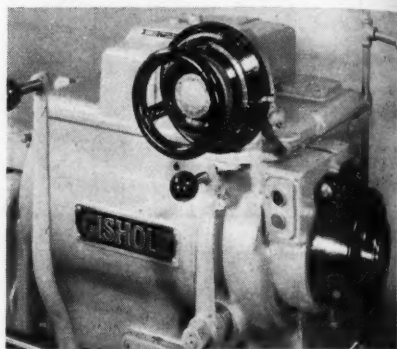


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Sheet Lead, Pipe,
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Flux-Cored Solders

ALPHA METAL & ROLLING MILLS, Inc.
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A high impact plastic dial and control is shown applied to the speed selector of a Gisholt No. 4 Ram Type Universal



Gisholt No. 4 Ram Type Universal Turret Lathe Equipped with Eclipse Plastic Speed Selector Dial and Control Wheel, Chuck Guard, and Handle Knobs

Turret Lathe for use in obtaining easily and quickly any one of 12 available spindle speeds. To use, the operator

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ADJUSTABLE
While Running!



Absolutely Different

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machines or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, undercuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

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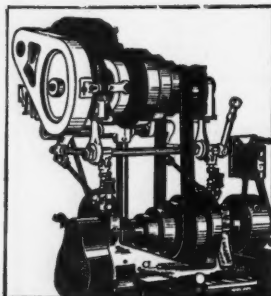
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BEVEL — HELICAL
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Get it in a motor drive—install Remcos. Motor takes hold gradually by slipping belt—simple friction-clutch action. No clash of metal-on-metal. Shockless speed changes made without removing tool from cut in most cases. Less down-time—more out-put. No tool marks. No other drive like the Remco. Hundreds of satisfied users testify to this fact. Investigate—write! Remco Products Corp., State and Hay Sts., York, Pa.

REMCO MOTOR DRIVES

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TAP

EXTRACTORS

Walton alloy steel "fingers," which fit the flutes of the tap, grip and back out the broken piece quickly, easily and without damage to threads.

30 DAY TRIAL OFFER

Stock sizes from No. 4 machine screws to 1 1/2" in 2, 3 or 4-flute types.

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The WALTON Co.

98 ALLYN ST.

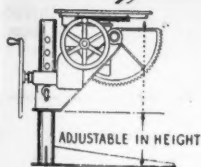
HARTFORD • CONN.



★ welding economy

STARTS

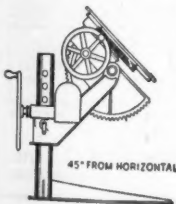
with efficient handling
of welding assemblies



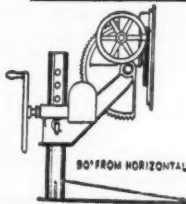
ADJUSTABLE IN HEIGHT

After a welding assembly is once fastened to the table of a C-F Welding Positioner, the welder, without any other help, can tilt the work to any angle from horizontal to 135° beyond horizontal and he can turn it to any degree within a complete circle. This means better welds all "down hand," safer handling and faster production. Sizes from 1,200 to 14,000 lbs. capacity are described in our booklet WP-22. Write for your copy. It tells the complete story.

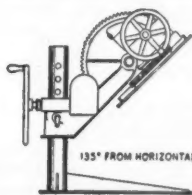
CULLEN-FRIESTEDT CO., 1311 S. Kilbourn Ave. Chicago, Ill.



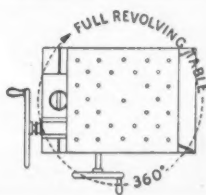
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90° FROM HORIZONTAL



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FULL REVOLVING TABLE

360°



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75% through use of the
New Advance Clamps
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Clamp directly over work. For use on all machines with T-slots. Standard and Heavy-Duty type.

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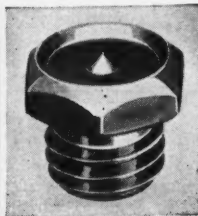
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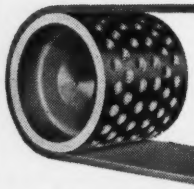
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**30 Day Free
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Stock most Std. Sizes to 16" Dia.
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**We Supply Fractional Dia. and Face Pulleys—From
Large Casting Stock.**

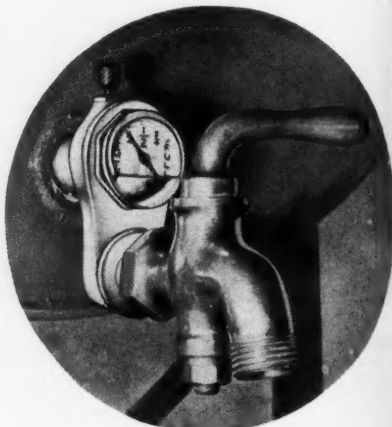
VACUUM CUP METAL PULLEY CO., Inc.
12536 Grand River Ave.,
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**Increase
your
Production**

simply sets the speeds desired on the special dial, and the machine automatically makes the shift to the correct spindle speed. The inner dial is red in color and the outer dial is black to provide contrast for ease in reading. Other plastic parts shown on the machine are handle knobs and a chuck guard.

U-C Level Indicator

Designated as the U-C, a level indicator designed to show at a glance the contents of drums of oil, solvent, or

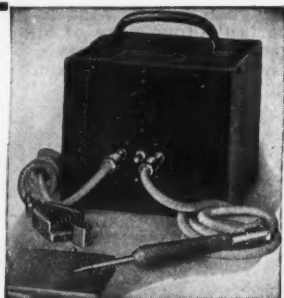


U-C Level Indicator

other liquids is now being offered by the Pack-Rite Machine Corp., 828 N. Broadway, Milwaukee, Wisconsin.

To use, the indicator is simply threaded into the faucet opening of any standard 55-gallon steel drum. The faucet it.

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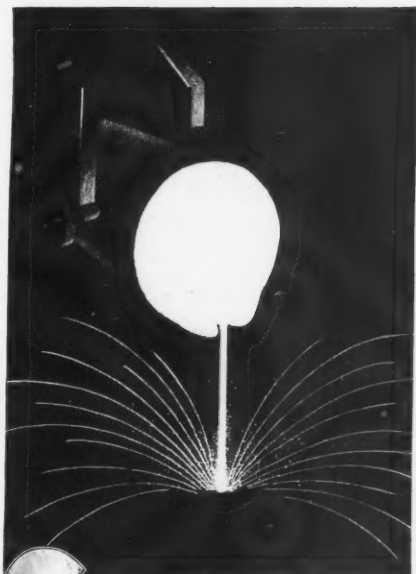
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Hartford, Conn., U. S. A.

CAPEWELL

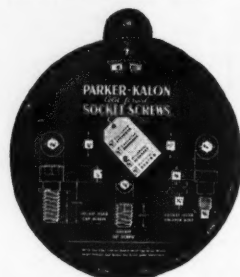


self is then screwed into an opening in the indicator body. When a drum becomes empty, the entire assembly can be readily removed and attached to a full drum.

Parker-Kalon Socket Screw Dimension Finder

The Parker-Kalon Socket Screw Dimension Finder shown in the accompanying illustration is now being offered free by the Parker-Kalon Corp., 198 Varick St., New York, N. Y. The finder is

designed to show at a glance all important dimensions of standard sizes of socket head cap screws, stripper bolts, and set screws. The finder is 10 inches



Parker-Kalon Socket Screw Dimension Finder

GRAY TURRET HEAD METAL CUTTER OR NIBBLER



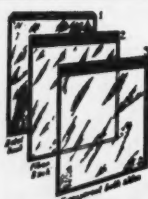
GRAY, Originator of First Practical Metal Cutter or Nibbler

Most modern Nibbler for Template Cutting, Tool Rooms, Shipbuilding, Aircraft Parts, Aircraft Tubing, Sheet and Plate Shops.

GRAY MACHINE CO.
Box 596, Philadelphia, Pa.

in diameter and is printed in two colors on heavy card stock.

The Parker-Kalon Socket Screw Dimension Finder will be sent free of charge to designers, engineers, drafting and production men in key positions addressing a request on their company letterhead, mentioning their title.



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Made in three styles, transparent, fibre, and metal backs. Non-inflammable acetate windows. Special style or size to order. Write for details.

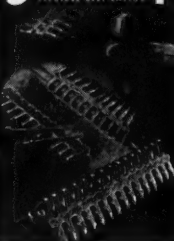
WAITE INSTRUMENT COMPANY

Phone: CEDAR 4728

1422 E. 109th St., Dept. M., Cleveland, Ohio

ARMSTRONG-BRAY

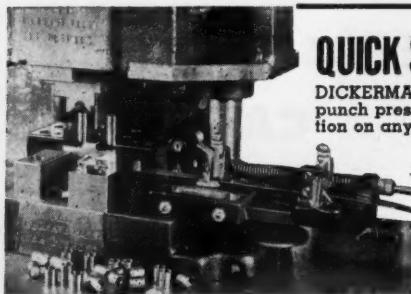
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8 sizes boxed or in long lengths for wide conveyor belts. Best for rubber and fabric belts because it compresses belt ends and prevents fraying. Applied in a few minutes with a hammer. 2-piece hinged rocker pins.

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ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5346 N. W. Hwy., Chicago



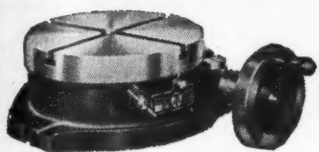
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DICKERMAN Hitch Feeds are adaptable to any ordinary punch press without press alterations. Feeds from any position on any style die... from zero to its limit (2" on 2" Hitch Feed and 4" on 4" Hitch Feed) for each stroke of the press.

Quick set-up... economical for short runs.

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FAST DELIVERY GUARANTEED

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12" 160.00

15" 185.00

18" 220.00

Heavy Duty

18" 350.00

21" 500.00

25" 590.00

Our rotary table will take the place of a costly fixture. It is used for all kinds of work on milling machines, shapers, drill presses and horizontal boring mills.

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**WE CAN ALSO FURNISH DIVIDING
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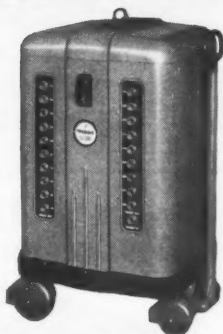
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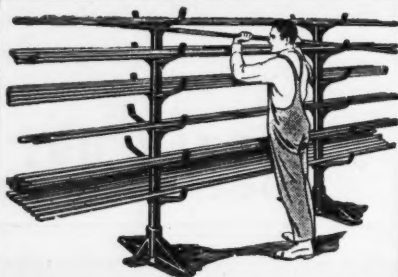
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Plastics. By J. H. Dubois. Published by the American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. 291 pages, 131 illustrations, 37 tables. Cloth binding, board covers. Price, \$3.00.

This book contains a simplified presentation of the manufacture and use of the important plastic materials and products together with tables of their properties plus the basic design information required by engineers and designers. The book explains in narrative and interesting form how various common materials and even waste or by-products are put together to form the several plastic materials now available for use. It gives an excellent historical account of all plastics and traces the discoveries, developments, and experiments in an unusually interesting manner.

"Plastics" omits formal chemistry but explains what happens when various materials are handled in certain manners. It stresses how all plastic materials are used, what can be made with them, where to use various kinds, which will withstand fire, which can be melted, how to form them into commod-

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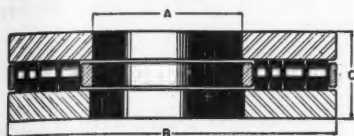
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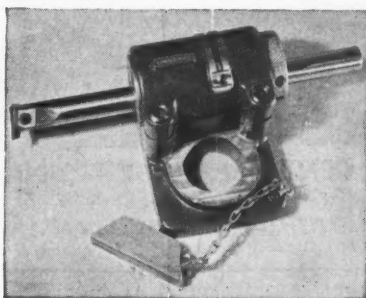
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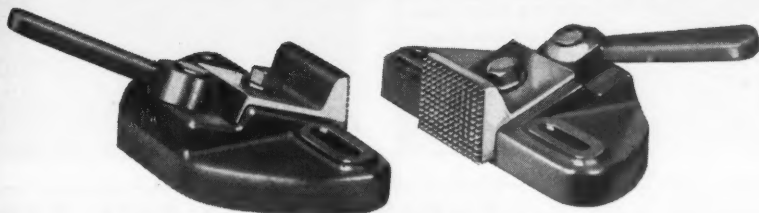
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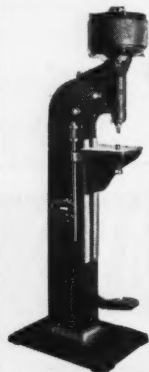


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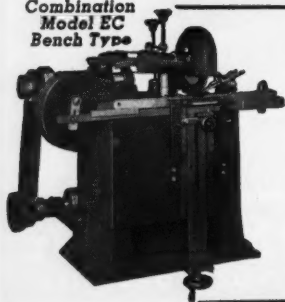
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Shop Literature

Wheelco Measuring and Control Instruments. Wheelco Instruments Co., Harrison and Peoria Sts., Chicago, Ill., has prepared a 16-page bulletin featuring a condensed listing of its complete line of measuring and control instruments. The bulletin describes and illustrates unit construction of temperature controllers and explains the company's "electronic principle" for effecting control without contact between the measuring and control functions of the instrument. Remote controllers, combustion safeguard equipment, and other instruments are also covered. The bulletin gives prices and lists numbers of catalog sections for easy reference when full information is required on any item of equipment. Copy of Bulletin No. Z6000 free upon request.

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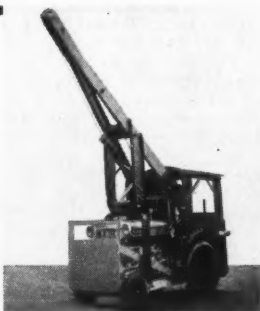
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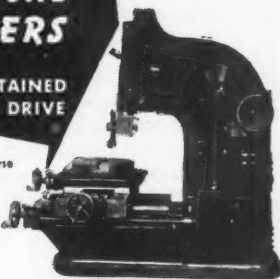
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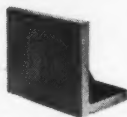
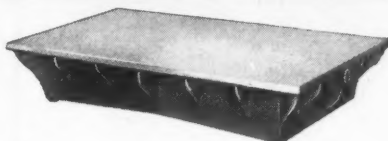
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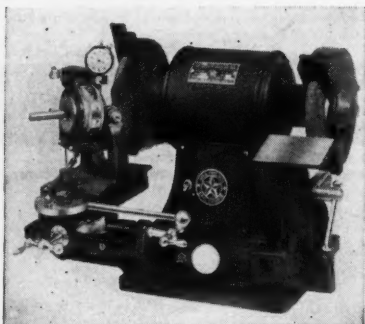
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"Warfare Chemical Hazards." L. L. Hedgepeth, Manager of Technical Service for the Pennsylvania Salt Mfg. Co., is the author of a study entitled "Warfare Chemical Hazards." It is a reprint of an informal lecture given by the author before air raid wardens in Delaware County, Pennsylvania.

Mr. Hedgepeth discusses gas warfare from the standpoint of civilian defense protective measures. The effects of gas are discussed, and the article also names the principal war gases, describes their characteristics, and suggests first aid treatment for victims. The study voices a note of reassurance, giving the civilian a calm, nontechnical understanding of what actually is involved in gas warfare.

The study appears as a supplement of "The Laundry Bundle" published by the company for May, 1942. A limited supply of reprints is available for interested persons upon request to the Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pennsylvania.

OEM Handbook. A 72-page booklet describing the functions and organization of the war agencies within the Office



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for Emergency Management is announced by this office. The booklet describes in detail the organization of the War Production Board, the Office of Price Administration, and the other constituent agencies of the OEM. Personnel is listed in most cases down to the branch level in each agency. Included are organization charts of the WPB and the Bureau of Industry Branches of the WPB Division of Industry Operations, as well as a chart showing the relationship of the various Federal war agencies.

Copies of the booklet are available from Room 1501, New Social Security Building and from the Superintendent of Documents, Washington, D. C., and at OEM field offices.

Wendt-Sonis Cemented Carbide Tipped Cutting Tools is the subject of a 32-page catalog now being issued by the Wendt-Sonis Co., Hannibal, Mo. The catalog contains illustrated and tabular information on Wendt-Sonis standard cemented carbide tipped straight flute drills, twist drills, masonry drills, core drills and holders, shell core drills, counter-bored, spotfacers, straight and taper shank reamers, stub screw machine reamers, shell reamers, straight and taper shank end mills, shell end mills, hollow mills, centers, and tool bits of various styles as well as special tools. Copy of Catalog No. 142 free upon request.

"Simplified Print Making" is the title of an interesting 24-page booklet released by Ozalid Products Division, General Aniline & Film Corp., Johnson City, N. Y. The booklet illustrates and describes the Ozalid process of simplified whiteprint making, the various Ozalid sensitized print making materials available, and the various model and type Ozalid whiteprint machines and dry developing machines. The booklet also includes other useful and interesting information about Ozalid whiteprints. Copy free upon request.

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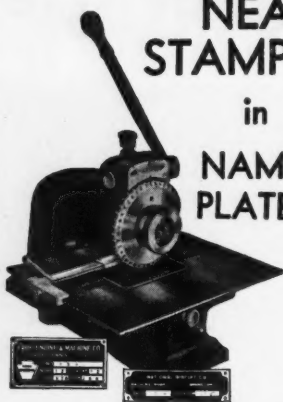
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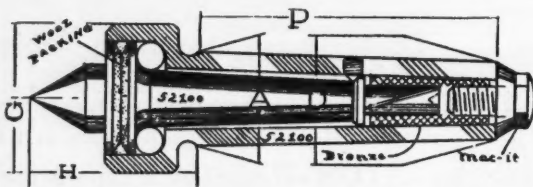


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This machine quickly stamps details
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"Single-Point Diamond Tools," an 12-page illustrated booklet prepared by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y., contains useful information regarding diamond tool sizes and prices, octahedron, ready-set, and chisel-edge diamond tools, as well as the "Dykon" gage and "Sta-Kool" holder. Copy free upon request.

Michigan 1205 "Sine-Line" Gear Lead Checker is the subject of a bulletin now being distributed by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich. The bulletin includes information covering the "Sine-Line" method of operation, dimensions, and other data regarding the machine, which is capable of measuring gear leads from zero to infinity. Several views of the operating mechanism and a table of specifications are also included in the bulletin in addition to illustrations of the unit. Copy free upon request.

"Quicker for Victory" Production Booklet. A roundup of the "Quicker for Victory" War Production Program at the Cleveland works of the Westinghouse Electric & Mfg. Co. is included in an eight-page booklet prepared by this firm. The booklet describes the organization of the "Q4V" program, showing samples of promotion literature. A copy of the employee's pledge card and the "Q4V" pin appear on Page 3. The specific objectives of the organization are outlined thoroughly. Additional subjects treated include keeping contact with Westinghouse men at the front, the use of "Quicker for Victory" stickers on letter and automobiles, and a "Quicker for Victory" bond campaign.

Copy of the booklet may be obtained from the Lighting Division, Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

Aeronautical Products, Inc. says "We have used Rigid Live Centers exclusively for years and have never seen one of them overloaded. While the same work from a dead center would have melted it."

Supplements for "Priorities in Force."

The Division of Industry Operations, War Production Board, Room 1501, Social Security Bldg., Washington, D. C., is now issuing the second in a series of supplements to be used with the revised edition of printed compilation of priorities orders and forms called "Priorities in Force." The revised booklet, which merges the original booklet, dated to March 31st, and its corresponding supplements in one alphabetical listing of all priorities actions through May 31, 1942, will be available for distribution soon.

The present supplement adds to the revised publication the orders issued for the period June 18th through June 24th. The first supplement to this revised booklet, issued June 13th, listed priorities actions for the period June 1st through June 10th and may be obtained by requesting WPB-1332.

Wesson High Production Tools. The Wesson Co., Ferndale, Mich., now has available a 56-page Wire-O bound catalog covering its complete line of high speed steel and cemented carbide tools. High speed steel tools treated include standard counterbore cutters, standard countersinking cutters with and without pilot hole, taper and straight shank toolholders, standard pilots, back spot-facing cutters and pilots, stop collar holders, adjustable-for-length holders, counterbores with bayonet lock drive, and inserted blade milling cutters.

Cemented carbide tools covered include solid and two-piece core drills, counterbores, stub screw machine, straight shank, taper shank, and shell reamers, shell core drills, taper shank and shell end mills, inserted blade milling cutters, and centers. The catalog also illustrates and describes the Wesson Diamond Wheel Grinding Machine and Universal Vise. Copy free to mechanical executives upon request.

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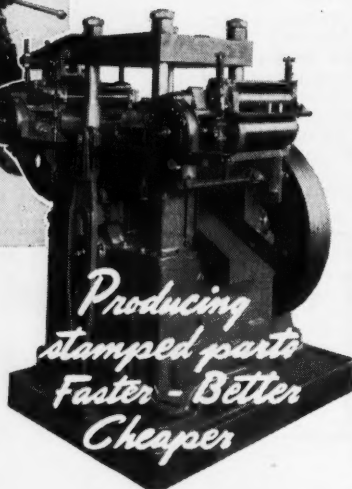
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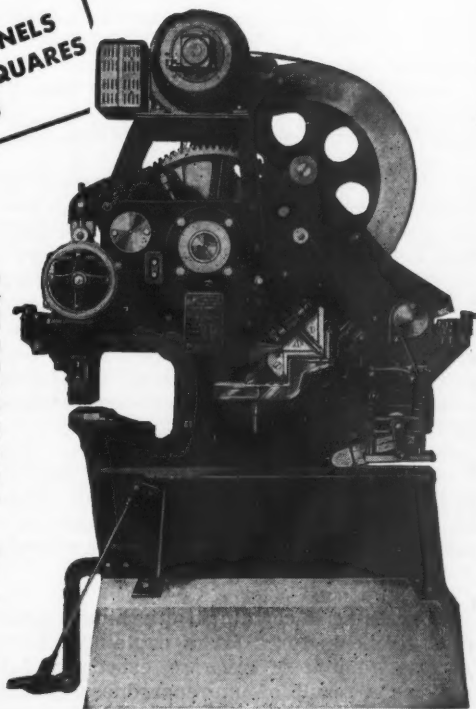


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The Last Word . . .

I see by the paper —

— that the U. S. is going to build 1,000 four-motor bombers a month for Britain. Going to? We have been building 4,000 planes a month for quite some time, now, and have been flying them over as fast as the ferry crew could make the round trip. Some have been going to England, some to Russia, some to Eritrea, some to China, some to Australia, some to Alaska. And God knows they are sorely needed at all of these points. We must produce faster — or face a long, gruelling, bitter war.

— that the "Little Steel" workers got a 44-cent increase in their wages. With a peace-time debt that has passed all possibility of liquidation at normal tax rates, to which is added a vast and ever-mounting war debt; in the face of a threat of inflation and desperate measures by the government to prevent such a catastrophe; with a ceiling on the price that a manufacturer can ask for his wares — at such a time the War Labor Board gives the steel-workers an increase. What a cock-eyed piece of business.

— that the Japs are now occupying three of the Aleutian Islands. Also that, out of an entire squadron of fifteen marine torpedo planes sent against the Jap fleet in one phase of the historic Midway battle, not one returned and there was but one survivor. We suffered severe losses to gain that memorable victory, and these are to be expected — but why do we have to wait so long to be told of them? Such information is important to the American people, and could have been of no more value to the enemy then than it is now. The reaction when we get the facts is much worse than it would have been directly after the battle, and now we are wondering what other bad news the censors are holding back. Government censorship can cut American morale to pieces if it isn't handled intelligently.

— that one of the islands now occupied by the Japs is only 650 miles west of Dutch Harbor. That is too close for comfort. Congressional Delegate Dimond of Alaska says the Jap force consists of 20,000 to 25,000 men on the three islands, suggests that failure to clean the Japs out of there immediately will be a sad mistake.

One thing is certain; if anything happens to our Dutch Harbor base, someone will be in for a lot of explaining to the American people. We expect a certain amount of reverses, especially during the first year of the war, but only as a result of unpreparedness and not as a result of poor generalship. Maybe we had better fetch MacArthur back to Washington and let him run this show; what?

Howard Campbell

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This man can build for the future—help win the war—and make good money doing his part—in our factory.

Located in a city of 40,000 in the industrial area of Michigan, on a river, he will be in pleasant surroundings; a fine place to bring up his family.

Give your qualifications and send a picture, if possible, to our Advertising Agency. It's a real opportunity for the right man.

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REYNOLDS BUILDING, JACKSON, MICHIGAN

Westinghouse Maintenance Hints Notebook. A handy notebook containing rules and suggestions concerning the care of electrical apparatus has been prepared by the Westinghouse Electric & Mfg. Co. The notebook, which is divided in two volumes, includes a total of 220 pages which are separated into 15 chapters.

Volume I covers the inspection of electrical apparatus, insulation materials and applications, the cleaning, drying, and testing of insulation, commutator maintenance, starting and regulating of a.c., d.c., and squirrel cage induction motors. All necessary information for the proper maintenance of insulation and motors is given, with diagrams, tables, and charts included to make the text easy to follow.

Volume II is devoted to contactor maintenance, the inspection of transformers, and a chapter on transformer



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connections. A number of wiring diagrams embrace all of the more common connections for two and three phase, 25 and 60 cycle power transmission.

Copy of notebook will be sent free to maintenance men addressing a request to the Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa.

"Grinding Wheel Care & Safety" is the title of a small folder which is now being issued by the Standard Safety Equipment Co., 232 W. Ontario St., Chicago, Ill. The folder contains practical tips suggested by foremen for the use and storage of grinding wheels, and quotes specific instructions for the prevention of accidents in connection with grinding wheel use. Several types of accident prevention equipment are illustrated and described in the folder, copy of which is available free upon request.



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